# County of Santa Clara
# Climate Action Plan for Operations and Facilities

## September 2009

**Adopted by the Board of Supervisors on September 29, 2009**

**Produced for the Board of Supervisors**
**by the Climate Change and Sustainability Program**

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## Acknowledgments

**Many thanks to all the departmental staff who have helped develop this plan and to the managers and department heads who allowed staff to dedicate some time to this project , and with special acknowledgement to:**

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### The Climate Action Team:

Over 70  people have been interested in the CAT and have followed or participated in bits and pieces of the work that went into this Plan. The following people have been active participants of the process and helped to shape the outcome:

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## Executive Summary

In 2007, the Santa Clara County Board of Supervisors signed the Cool Counties Climate Stabilization Declaration and established a set of aggressive goals for greenhouse gas (GHG) emission reductions for the County:

- Stop increasing the amount of emissions by 2010
- Decrease emissions by 10% every 5 years from 2010 – 2050
- Reach an 80% reduction by 2050

This document represents the yearlong collaborative work of an interdepartmental Climate Action Team (CAT) led by the Climate Change and Sustainability Manager. The CAT met on a regular basis throughout the year and offered ideas and guidance for the development of the Climate Action Plan, hereafter referred to as the CAP.

This CAP focuses on County operations, facilities and employee actions that will reduce not only GHG emissions but also energy and water consumption, solid waste and fuel consumption. The CAP focuses primarily on steps needed to reach the 10% reduction goal by 2015 but also identifies policies and actions that are needed to set the stage for reductions past 2015.

The Baseline Inventory for 2005 attributed 133,459 metric tons of GHG to County operations and facilities. The CAP is using the 2005 Inventory as its baseline for future reductions.

Over the past eight years, the County has addressed its resource consumption by implementing energy efficiency and water conservation projects, designing and building green buildings, purchasing hybrid and alternative fuel vehicles, providing Eco Passes to employees to encourage the use of transit and encouraging reduced consumption. These actions have resulted in the leveling off of GHG emissions that are observable from 2005 to 2008, if we exclude the change in the PGE conversion factor. This CAP focuses on the next steps and acceleration of our progress.

The reduction target for 2015 is 13,346 metric tons. This report includes projects with potential savings of over 30,000 metric tons and identifies policies, procedures and approaches to reduce global GHG impacts, even if they are not locally measurable in subsequent inventories.
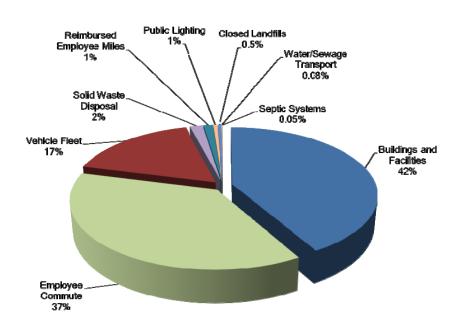
> **Overall, the County 2005 baseline of GHG emissions is 133,459 metric tons.**
> **The GHG reduction target for 2015 is 13,346 metric tons.**
> **This report identifies over 30,000 metric tons of potential reductions.**

GHG can be divided by sectors, which allows us to see what types of activities generate the most GHG. In the County of Santa Clara, the two sectors that account for the most GHG emissions are Buildings and Facilities and Employee Commutes, representing together almost 80% of emissions. The following pie chart and table show the breakdown of GHG by sectors.

## County Operations and Facilities GHG by Sector

| Sector | Greenhouse Gas Emissions Metric Tons CO$_2$(e) |
|---|---|
| Buildings and Facilities | 55,648 |
| Employee Commute | 49,738 |
| Vehicle Fleet | 22,706 |
| Solid Waste Disposal | 2,207 |
| Reimbursed Employee Miles | 1,596 |
| Public Lighting | 749 |
| Closed Landfills | 645 |
| Water/Sewage Transport | 104 |
| Septic Systems | 66 |



The full report covers details and analysis of each of the sectors and sources of GHG emissions, presents the inventory in relation to departments and discusses potential options. The following recommendations are summarized from the CAP and will move the County towards meeting the 2015 goal and establish a strong basis for continuing reductions.

## Recommendations to Address GHG Reductions for Operations and Facilities

**Already underway by departments:**

1. Complete and implement the Environmentally Preferable Purchasing Policy.
2. Revise and implement the Green Building Policy for County buildings.
3. Implement the Utility Data Management System for all facilities and the Asset Works for all fleet vehicles.
4. Complete the telecommuting policy and program; roll out to all interested departments.
5. Integrate the three Green IT Strategies into the Countywide Three-Year IT Plan.
6. Establish a 75% waste diversion goal for facilities and parks. (GHG reduction of 1,525 metric tons)

**New Actions**

7. Develop a No Idling Policy.
8. Develop a simplified GHG calculation process for FY, with 2009/10 being the first one to report. Establish data tracking systems in affected departments.

9. Develop Best Practices guidelines for refrigerants, septic systems, water transport and closed landfill emissions, as needed.
10. Establish a new Board Policy that allows utility savings resulting from approved energy, water, and waste projects to accrue to Energy Holding Accounts, consistent with existing BOS Policy 4.14.
11. Establish a LEED EBOM program for facilities that can be implemented incrementally as funding allows.
12. Develop a long term water reduction plan.

**Additional Recommendations relating to quantitative GHG reductions:**

13. Continue to pursue grant funding possibilities and Renewable Energy Task Force recommendations to identify opportunities to fund any of the following: commute program, telematics, renewable energy, co-generation, LED street lights, green technology projects and energy and water efficiency projects.
14. At the next Annual Fleet Replacement decision, consider funding solutions including vehicle lease contracts in order to accelerate fleet replacement. By leveraging modern technologies and alternative fuel vehicles, MPG per vehicle will increase and emissions will decrease.
15. Add GHG reduction and energy and water efficiency criteria to the next round of Capital Projects concept paper requirements and review, identify and fund enough energy efficiency projects to enable the County to reach the 2015 goals.
16. Each year, upon review of the GHG emissions data from the previous year, adjust the Capital Projects list priorities to ensure that efficiencies are being implemented at a rate that is congruent with reaching our goals.

## Introduction

In 2007, the Santa Clara County Board of Supervisors signed the Cool Counties Climate Stabilization Declaration and established a set of aggressive goals for greenhouse gas emission reductions for the County. At that time, they authorized the addition of two staff positions to support reaching these goals. The Utilities Program Manager in the Department of Facilities and Fleet focuses on utilities management for all departments. The Climate Change and Sustainability Manager was tasked with ensuring that the County reduce its environmental and climate impacts.

This document represents the yearlong collaborative work of an interdepartmental Climate Action Team (CAT) led by the Climate Change and Sustainability Manager. The CAT met on a regular basis throughout the year and offered ideas and guidance for the development of the Climate Action Plan, hereafter referred to as the CAP.

This CAP focuses on County operations, facilities and employee actions that will reduce not only greenhouse gas emissions but also energy and water consumption, solid waste and fuel consumption. These are areas of opportunity for the County to make a difference, set a good example and, in many cases, save money.

The greenhouse gas (GHG) emission reduction goals set by the Board of Supervisors are quite stringent and require a change from "business as usual" to attain them. The goals are to

- Stop increasing the amount of emissions by 2010
- Decrease emissions by 10% every 5 years from 2010 – 2050
- Reach an 80% reduction by 2050

This CAP focuses primarily on the 10% reduction goal by 2015, which will be challenging to reach without a significant turnaround in County revenues, which would allow for increased investments in GHG-reducing projects. The CAP also identifies policies and actions that are needed to set the stage for reductions past 2015. In addition, the ability to reach the 2050 goal depends on the continuation of strong federal and state legislation and policy and PGE generating or purchasing greener electricity.

Santa Clara County's CAP is being issued in the context of legislative and regulatory action at the federal and state level. California's climate change goals are set forth in AB 32, the Global Warming Solutions Act of 2006. This legislation requires a reduction of California GHG emissions to 1990 levels by 2020. In December 2008, the California Air Resources Board (CARB) approved the Climate Change Scoping Plan Document required by AB 32. The Scoping Plan Document, which provides a roadmap for California to reduce its greenhouse gas emissions, recognizes the importance of development and implementation of Climate Action Plans by California cities and counties. Executive Order S-03-05 goes even further by requiring statewide reductions in GHG emissions to 80 percent below 1990 by the year 2050.

In addition, addressing climate change is a key part of the agenda in Washington, DC. The U.S. House of Representatives passed its climate change legislation, the American Clean Energy and Security Act of 2009 (HR 2454), in June 2009. Under the current version of the legislation, a sizable portion of the allowances under a cap-and-trade program are slated to be distributed to local governments to support energy efficiency and renewable energy programs.

In 2008, Joint Venture Silicon Valley established a cooperative agreement with ICLEI, a nonprofit that focuses on sustainability in local government, to provide greenhouse gas inventories for a group of cities and counties, including the County of Santa Clara. The County's baseline 2005 inventory was completed in May 2009 according to the inventory protocols established by the California Air Resources Board. Hundreds of hours of staff time went into collecting, sorting and providing the initial data to ICLEI and in answering subsequent questions.

After the baseline inventory was completed, an analysis of the main sources of greenhouse gases was done to estimate the change in emissions from 2005 to 2008.

The Inventory and the CAP do not address community-scale GHG emissions or countywide emissions, nor do they offer recommendations for reducing these. This document focuses solely on operations of the County, County employee impacts (such as their commutes) and facility energy and fuel usage.

> **Overall, the County 2005 baseline of GHG emissions is 133,459 metric tons.**
> **The GHG reduction target for 2015 is 13,346 metric tons.**
> **This report identifies over 30,000 metric tons of potential reductions.**

## Terminology and Methodology

Greenhouse gases (GHG) are measured in metric tons, 2,204.6 pounds to a ton. Although there are many different GHG, for purposes of analysis and reporting all GHG are converted to the equivalent of carbon dioxide ($CO_2$), which is the most prevalent GHG. Equivalent GHG are reported as $CO_2$ (e).

The Appendix to this document includes a reference for sources of data and elaborates on the methodologies used to calculate GHG emissions and reductions.
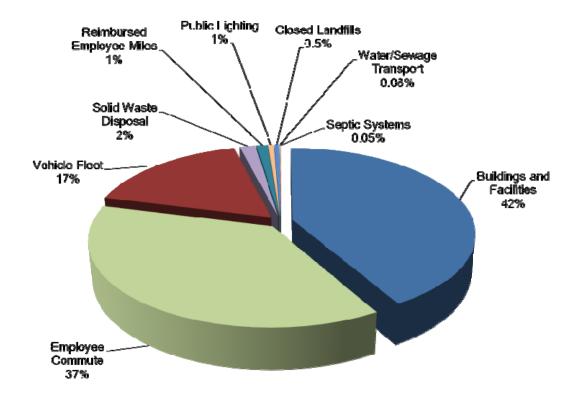
## The Greenhouse Gas Inventory and Analysis

This section includes information on the baseline inventory provided by ICLEI, changes in emissions from 2005 to 2008 and some analysis of the data and trends. According to the baseline inventory, the following set of charts and tables divide up the County's 133,459 metric tons of greenhouse gas emissions by sector and source.

1. **GHG Emissions by Sector**

| Sector | Greenhouse Gas Emissions Metric Tons $CO_2(e)$ |
|---|---|
| Buildings and Facilities | 55,648 |
| Employee Commute | 49,738 |
| Vehicle Fleet | 22,706 |
| Solid Waste Disposal | 2,207 |
| Reimbursed Employee Miles | 1,596 |
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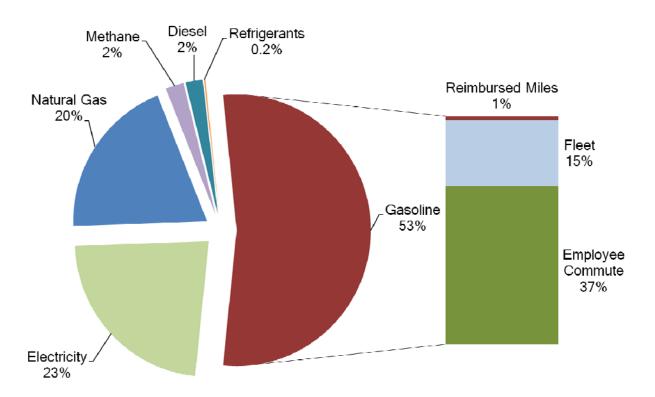
When the GHG emissions are divided by sector, Buildings and Facilities account for 42% of the GHG emissions; the 55,648 metric tons includes impacts from electricity, natural gas and refrigerants.

## 2. GHG Emissions Divided by Source

| Source | Greenhouse Gas Emissions Metric Tons $CO_2(e)$ |
|---|---|
| Gasoline | 71,097 |
| Electricity | 30,469 |
| Natural Gas | 25,994 |
| Methane | 2,918 |
| Diesel | 2,758 |
| Refrigerants | 223 |

When the data is separated by sources, gasoline is the biggest contributor at 53%. The 71,097 metric tons of GHG from gasoline reflect the combined consumption of the fleet, employee commutes and personal vehicle miles used for business and reimbursed by the County.
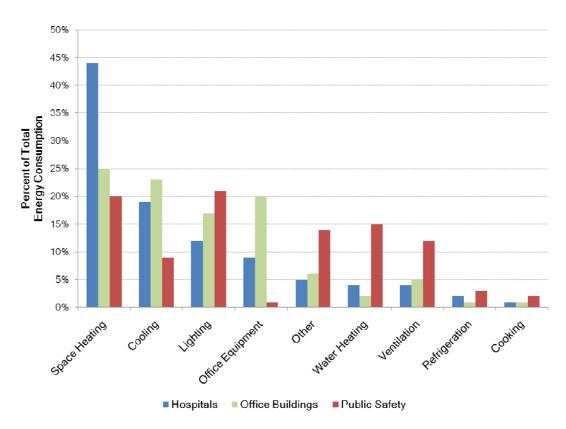


## Facilities and Energy

The GHG emissions in County facilities not only makes up the largest sector of GHG emissions, it also has risen by 35% from 2005 to 2008, most of which is attributable to a change in where PGE purchased electricity. The primary consumers of this energy are office buildings, hospitals, and public safety buildings, such as jails. In 2003, The Energy Information Administration

conducted a national survey of different types of facilities to determine energy end use at these buildings. The following graph shows where energy is used in each of these three building types.

### 3.  National Averages for Energy End Use in Hospital, Office, and Public Safety Buildings



The national survey also included average energy intensities by building type, where energy intensity is defined as the amount of energy consumed per square foot. The following table gives average energy intensities for hospitals, office buildings, and public safety buildings. This table also gives a combined and weighted national average, which is each facility's energy intensity weighted according to our actual energy usage and then combined to represent an average for county operations similar to our own.
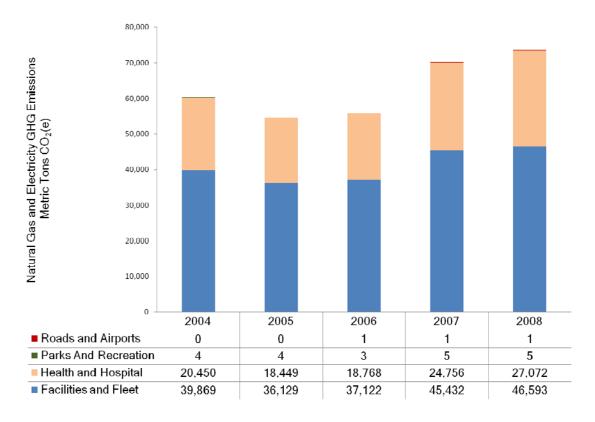
### 4.  National Averages for Energy Intensity by Facility Type vs. Our Facilities

| Source | Hospitals | Office Buildings | Public Safety Buildings | Combined & Weighted National Average | Our Facilities |
|---|---|---|---|---|---|
| Electricity (kWh/sq-ft) | 22.9 | 17.3 | 15.3 | 18.8 | 15.6 |
| Natural Gas (therms/sq-ft) | 0.925 | 0.318 | 0.437 | 0.59 | 0.63 |

Comparing this average to our buildings, the County's facilities are either on a par with, or more efficient than the average, consuming 15.6 kWh and 0.63 therms per square foot compared with the national average of 18.8 kWh and 0.59 therms per square foot. The Valley Medical Center, the second largest consumer of energy, has an energy intensity of 165.7 kBtu per square foot per year and falls on the low end of the energy consumption spectrum with the average Energy Star hospital having an energy intensity of 191.28 kBtu per square foot per year. Energy Star ratings are based upon Btus in order to combine electricity and natural gas energy intensities into one total energy intensity factor. More information on Btus, and how they are converted to kWh and therms, can be found in the appendix. Overall, compared to the national averages, County buildings are performing well.
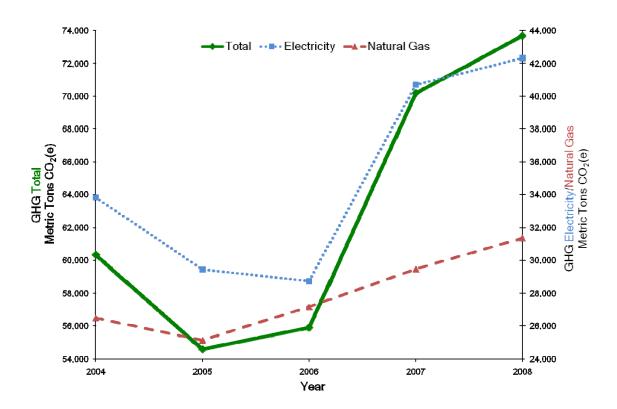
The following chart and table breaks down the facilities data into the four departments that manage facilities: Roads and Airports, Parks and Recreation, Health and Hospitals, and Facilities and Fleet. Clearly, the biggest impacts are from the latter two.

### 5.  Five Year Trend for GHG for the Four Departments that Manage Facilities



| | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|
| ■ Roads and Airports | 0 | 0 | 1 | 1 | 1 |
| ■ Parks And Recreation | 4 | 4 | 3 | 5 | 5 |
| Health and Hospital | 20,450 | 18,449 | 18,768 | 24,756 | 27,072 |
| ■ Facilities and Fleet | 39,869 | 36,129 | 37,122 | 45,432 | 46,593 |
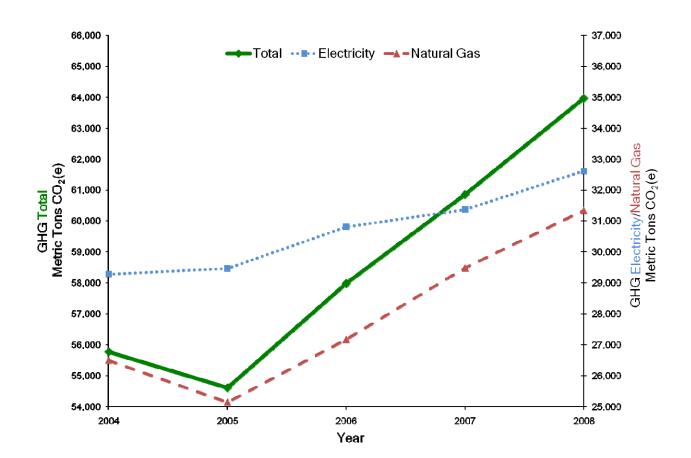
The data used to analyze trends is slightly different from the data used for the ICLEI Inventory but it is consistent for the annual changes. The following five-year graph shows the total GHG (scale on the left) and the GHG from the change in electricity and natural gas consumption (scale on the right) for County facilities.

6.  **Five Year Trend for GHG from Electricity and Natural Gas in Facilities**
    (Electricity is converted to GHG using yearly conversion factors)



Overall facility data shows that electricity consumption produces more GHG than natural gas consumption. GHG calculations are not only based on facility electricity and natural gas usage, but also on emission conversion factors from PG&E. The natural gas emission factor is a constant 11.64 pounds of $CO_2$ per therm, but the emission factor for electricity fluctuates depending on how the electricity is generated. Each year, PG&E calculates a factor that is based on the sources of the electricity they supply. Their sources should be getting cleaner, but in 2007, there was a 39% increase in GHG per kWh from 2006, resulting from a dry year that reduced availability of hydro power (a clean source) and replaced it with natural gas generated electricity and a small rise in coal-generated purchased electricity. At the time of this report, the factor for 2008 is not yet released; therefore, 2008 calculations use the 2007 conversion factor. Taking this into account, the following graph for GHG in Facilities has been normalized to the 2005 baseline emission factors illustrate actual consumption.
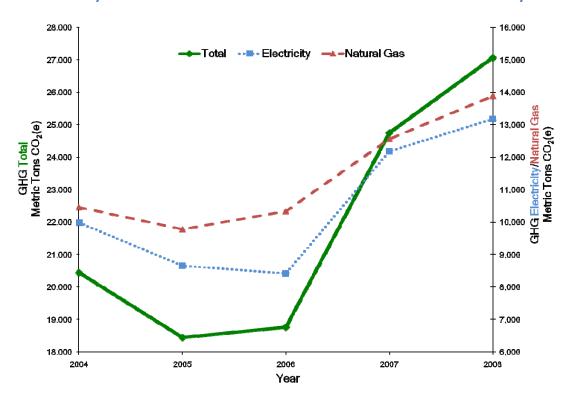
7.  **Five Year Normalized Trend for GHG from Electricity and Natural Gas in Facilities**
    All electricity is converted to GHG using the 2005 conversion factor.
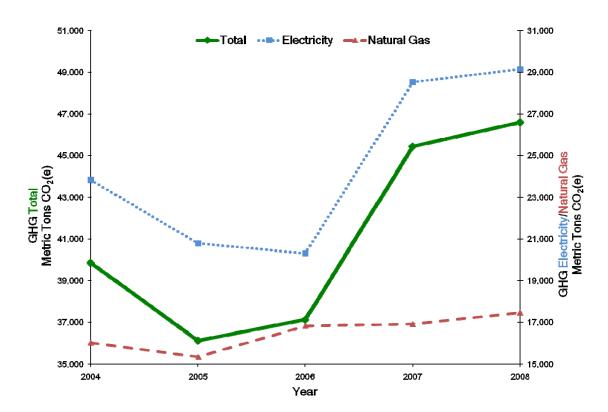


In the chart with normalization, it appears that consumption has increased since 2005, with natural gas increasing at a faster rate than electricity. While this is important to keep in mind, the environmental impact is based on actual emissions, so the following graphs are based upon the actual emission conversion factors by year from PG&E. As PG&E implements its plan to purchase cleaner electricity, the County will benefit in its GHG reductions.

The following two charts break out the Valley Medical Center (VMC) and the Facilities and Fleet (FAF) data. At the VMC, natural gas is a more significant contributor to GHG emissions than electricity.

8.  **Valley Medical Center 5 Year Trend for Facilities:  GHG from Electricity and Natural Gas**



9.  **FAF Department 5 Year Trend for Facilities:  GHG from Electricity and Natural Gas**

The changes from the 2005 baseline to 2008 represent a 35% overall increase with 8,622 metric tons being attributed to buildings managed by HHS and 10,462 metric tons to the buildings supported by the General Fund through FAF. Most of the change in consumption can be attributed to a 9% growth in square footage over these three years. But 17% of the increase in GHG is attributable to the change in the PGE factor. A more comprehensive review of specific facility data will be possible with the new FAF Utility Data Management System.
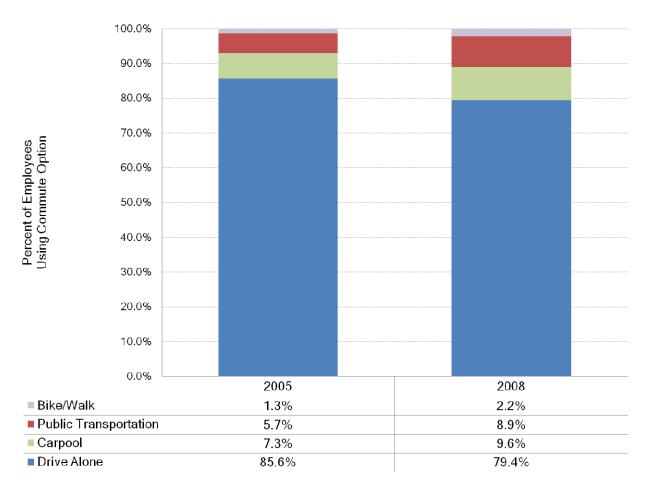
## Commutes

In 2008, two different commute surveys were done. The first had a response of 1,900 employees and produced quite a bit of information on commute patterns, barriers and suggestions. It also included a section for employees who worked for the County in 2005, which supplied averages for the baseline inventory. The second survey was done to provide ICLEI with additional information for their calculations. This sample size was much smaller (sample size: 310) and the results were adjusted to correlate with the larger, more reliable sample for the ICLEI Inventory Report. The initial survey shows that on average, the MPG for employee-owned vehicles increased from 23.5 in 2005 to 24.7 in 2008. We can expect that employees will continue to purchase vehicles with better MPG as the standards continue to improve in new cars and we will therefore see a natural reduction in greenhouse gas emissions from commuting as this occurs.

The initial survey asked for specific commute information for the day that the survey was taken. Given the large sample of respondents, this is reliable information. From this data it would appear that 7% of the employees used their Eco Pass on that day, although 48% indicated that they had used their Eco Pass at some time during that year. The following charts show the breakdown of how employees commuted to work on the day of the survey in 2008 (sample size: 1,683) and their regular commute patterns for 2005 (sample size: 1,418).

### 10. Employee Commute Comparison 2005-2008
(data from initial commute survey)



| | 2005 | 2008 |
|---|---|---|
| Bike/Walk | 1.3% | 2.2% |
| Public Transportation | 5.7% | 8.9% |
| Carpool | 7.3% | 9.6% |
| Drive Alone | 85.6% | 79.4% |

Employees were asked to suggest things the County could do to make alternative modes of commuting more appealing and to reduce emissions. Of the respondents, key suggestions included:

- o Allow telecommuting (14%)
- o Allow alternative or flex schedules (13%)
- o Help County employees connect with each other to form carpools (10%)
- o Provide information on commute options
- o Provide showers, bike lockers, safety training
- o Provide pre-tax commute passes for transit not covered by the Eco Pass

An Eco Pass survey done in May, 2009, by VTA had 896 County employee respondents, with respondents clearly skewed towards those that used their Eco Pass (78.1% of respondents) and who considered it an important benefit. Of the respondents, 55.4% used their Eco Passes 1-3 days per week, 18.6% used them 4-5 days per week, 4.1% used them 6-7 days per week and

21.9% never used them. 82.6% said that they would drive alone to work if this benefit was discontinued. In spite of the survey sample being skewed towards Eco Pass users, the survey results may reflect accurate assessments of frequency and attitudes of those who use their Eco Passes.

A future 2009 Employee Commute Survey will be carefully crafted to obtain reliable Eco Pass data as well as current commute patterns and potential ways to encourage change.

2008 data reflects a 19% smaller greenhouse gas footprint for employee commutes than the 2005 data provides. This is based on three changes: the increase in MPG for employee-owned vehicles (from 23.5 to 24.7); fewer people driving alone to work (from 86% to 79%) and employees living an average of 3 miles closer to work (from an average of 19 miles to 16 miles). Employee numbers have actually increased slightly (from 15,031 to 15,245), which offsets some of the savings.

### Fleet, Gasoline, Diesel, Employee Mileage (non-commute)
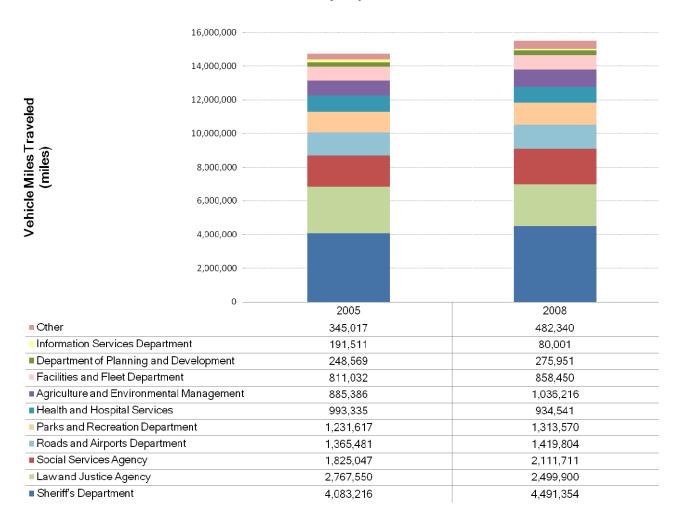
Gasoline consumption is by far the biggest source of greenhouse gas emissions; the 71,097 metric tons includes GHG from gasoline used by the fleet, in commuting, and in employees driving their cars for work-related business (reimbursed miles). The commute survey done in 2008 indicates that only half of the miles driven by employees, in their personal vehicles and on County business, are submitted for reimbursement. GHG from non-reimbursed miles are not included in the Inventory but an estimate would add an additional 1,084 metric tons to the emissions from gasoline.

It is important to consider the correlations between fleet usage, employee business mileage and commuting. Policy decisions about one area, such as number of pool and departmental assigned vehicles, may affect others, such as employee commutes. For instance:

- o  11% of employees who drive solo to work say that they do not take transit because they need their car at work. Making fleet cars less available or less predictable could result in more people choosing to drive to work.
- o  Making fleet pool vehicles more accessible for business could influence employees' commute decisions and more might take transit or carpool to work.
- o  Employee vehicles average 24.7 MPG. Although the average MPG for fleet is not yet determined, as the fleet is replaced with even more efficient cars there may be an advantage, in terms of GHG, for employees to drive fleet vehicles.

The following chart divides miles driven by department and illustrates both the comparison between years and the relative vehicle use among departments. Since this chart is based only on miles driven, it does not reflect the amount of GHG generated by department. It can be noted that the biggest departmental user of vehicles, the Sheriff's Office, is also the department that requires heavier, faster vehicles, which have lower MPG ratings.

## 11. Vehicle Miles Traveled in Fleet Vehicles by Department

| | 2005 | 2008 |
|---|---|---|
| ■ Other | 345,017 | 482,340 |
| ■ Information Services Department | 191,511 | 80,001 |
| ■ Department of Planning and Development | 248,569 | 275,951 |
| ■ Facilities and Fleet Department | 811,032 | 858,450 |
| ■ Agriculture and Environmental Management | 885,386 | 1,036,216 |
| ■ Health and Hospital Services | 993,335 | 934,541 |
| ■ Parks and Recreation Department | 1,231,617 | 1,313,570 |
| ■ Roads and Airports Department | 1,365,481 | 1,419,804 |
| ■ Social Services Agency | 1,825,047 | 2,111,711 |
| ■ Law and Justice Agency | 2,767,550 | 2,499,900 |
| ■ Sheriff's Department | 4,083,216 | 4,491,354 |

Overall, fleet GHG emissions probably had no significant change between the years 2005 and 2008. Although the vehicle miles have gone up, there has been an effort to purchase more efficient vehicles, which would reduce impacts. The reliability of the data on vehicle miles traveled (VMT) was sufficient to show broad distribution of departmental impacts, but may not accurately show change due to odometers being misread or broken ones replaced. More accurate data is needed on MPG and fuel consumption.

Employee reimbursed miles have remained constant from 2005 to 2008, although the higher average MPG in employee vehicles, as estimated from the initial Commute Survey, produces a small decline in GHG emissions from those miles.

## Waste and Recycling

Waste disposal represents about 2% of the emissions total; this is calculated by the amount of methane generated at the landfill from the disposal collected at County facilities. It does not

include emissions from the collection (transport) of trash and recycling, the processing of recycling or greenwaste/composting materials, or from energy used to produce the products the County consumes.

The impacts from purchasing choices and consumption are actually quite a bit higher than what is shown in an inventory because there are large upstream energy and fuel consumption patterns associated with products. For instance, the production of paper requires energy for logging, pulping, manufacturing and transportation. There are also energy, environmental and health impacts in bleaching paper from natural pulp color to bright white. The County mostly purchases 10% recycled paper, with some departments choosing either 35% or 100% recycled. This is an example where change in usage or purchasing habits can produce positive results in reducing emissions even though the emissions reduction will not be reflected quantitatively in future inventories without a change in measurement protocols.

There is very little difference from 2005 to 2008 in the amount of waste going to the landfill from County facilities.

## Other Sources and Sectors

Many sources or sectors that were quantified represent less than 2% of the overall inventory: refrigerants, septic systems, pumps, street lighting. While there may be actions that can be taken to reduce these, they will not significantly help the County reach the reductions needed and therefore, with the exception of street lighting, are not addressed in the CAP. The trends for these sources from 2005 to 2008 are assumed to have remained constant.

## Water, the Other Climate Change Factor

Energy required for water-related uses such as conveyance, distribution and treatment constitutes 19% of the total energy used in California. Considering California uses approximately 281,052,960 MWh of energy per year, water-related energy uses in California account for almost 11,239,378 metric tons of $CO_2(e)$ annually. Further, this does not include water heating, which makes up about 32% of total non-thermal power generation natural gas use in California (currently 4,994 million therms) and almost 88 billion gallons of diesel fuel. Combining these natural gas emissions with emissions due to electricity, water-related uses in California alone emit a staggering 37,805,784 metric tons of $CO_2(e)$ into the atmosphere annually.

This interaction is not exclusive: while water requires energy, so does energy require water. Thermoelectric energy production accounts for 48% of all water use in the United States. This water is used to cool the extremely high temperature machinery that is required to generate electricity.

Strictly considering the footprint of government operations, County facilities (data does not include the Valley Medical Center) make up 0.2% of the water use for Santa Clara County, representing almost 207 metric tons of carbon emissions annually for water-related uses. A brief

look at available water data shows an increase in consumption of about 86 acre feet (28,021,277 gallons) in the past eight years.

The relationship between water and energy is clear and the increase in consumption in County facilities emphasizes the need for further water data collection and analysis. Ultimately, a complete Water Action Plan will be required for County Operations and Facilities.

## Summary of Changes in Footprint from 2005 to 2008.

Overall, rough estimates of the County's emissions indicate that they have increased by 8% from 2005 to 2008. Sector data shows facilities' emissions increased by 19,088 metric tons and impacts from employee commutes partially offset that with a decrease of 8,594 metric tons.

In order to calculate the changes from 2005 to 2008, several assumptions were made and data sources are often different than what ICLEI used. In spite of some data inconsistencies, these are important numbers to understand. The Board of Supervisors' 2007 goals were based on reductions of GHG emissions *from current levels.*

An earlier analysis of this data using 2006 PGE factors showed that the County had made its 2010 goals of not increasing GHG emissions by 2010. Updating this information with the verified PGE number for 2007, and using the 2007 number for 2008 as well, shifts the overall changes in GHG emissions to show an 8% increase. Clearly, how PGE generates electricity and where PGE purchases supplemental electricity from are significant factors that can radically change the overall picture for the County. Given the fact that PGE is required to move towards clean sources, the County can be comfortable setting reduction goals based on the 2005 baseline data. As we track the PGE impacts and systems are put in place to more closely track data and it becomes easier to call up and analyze both facility and fleet data, the target can be adjusted. For now, the goal of reducing GHG emissions by 13,346 metric tons, which represents 10% of the 2005 baseline calculated by ICLEI, is a useful target.

## 12. Table of Changes from 2005 to 2008

| Sector | 2005 GHG Emissions Metric Tons CO$_2$(e) | 2008 GHG Emissions Metric Tons CO$_2$(e) | % GHG Emissions Change | Notes |
|---|---|---|---|---|
| Buildings and Facilities | 54,583 | 73,671 | 35% | Calculated using Facilities Data from 2005 through 2008 and changing PGE factors. (change includes 9% sf increase; 9% energy use increase, 17% PGE change in generation sources.) |
| Employee Commute | 45,795 | 37,201 | -19% | Based upon the initial Commute Survey. |
| Vehicle Fleet | 22,706 | 22,706 | 0% | Vehicle miles traveled increased but it is assumed that vehicle miles per gallon also increased and the two offset each other to keep emissions constant. |
| Solid Waste Disposal | 2,207 | 2,191 | -1% | Based on 2005 and 2008 waste hauler reporting. |
| Reimbursed Employee Miles | 1,272 | 1,092 | -14% | Reimbursed miles remained the same based on OBA data. Employee vehicle miles per gallon improved from 23.5MPG in 2005 to 24.7MPG in 2008 based on the initial Commute Survey data. |
| Public Lighting | 749 | 749 | 0% | Assuming constant or negligible change. |
| Closed Landfills | 645 | 645 | 0% | Assuming constant or negligible change. |
| Water/Sewage Transport | 104 | 104 | 0% | Assuming constant or negligible change. |
| Septic Systems | 66 | 66 | 0% | Assuming constant or negligible change. |
| Total | 128,127 | 138,425 | 8% | |

# Climate Action Strategies for Near Term (2015)

Given the current budget dilemmas in the county, the state and the nation, it is a challenging time to outline a strategy that can be funded and implemented. The yearlong Climate Action Team process to identify potential reductions, policy needs and opportunities for organizational change has produced a significant set of recommendations. Potential reductions are discussed at length in the following sections and provided in the following table. Actual recommendations for action are included in the final section of this report.

### 13. Summary Table of Potential Greenhouse Gas Reductions

| ACTION | COST $ not yet budgeted | ANNUAL SAVINGS | GHG REDUCTION* tonnes $CO_2(e)$ |
|---|---|---|---|
| CAPITAL PROJECTS | | | |
| Funded FAF Energy Conservation Projects | $0 | $532,027 | 1,019 |
| Unfunded FAF Energy Conservation Projects | $23,247,956 | $3,262,950 | 7,860 |
| Non-Prioritized Solar Renewable Energy Task Force (RETF) List | $61,600,000 | $561,181 | 4,868 |
| Prioritized RETF List | $92,820,000 | $845,598 | 7,334 |
| County Co-Generator at VMC | $30,235,919 | $2,716,377 | 1,473 |
| VMC Retro-commissioning Project | $0 | $173,625 | 365 |
| | | | |
| COMMUTE RECOMMENDATIONS | Unknown | | 3,038 |
| | | | |
| FLEET PROJECTS | | | |
| Installation of Telematics | $1,484,400 | Not available | 1,062 |
| Fleet Replacement (according to Ten Year Plan) | $14,000,000 | | 807 |
| Fleet Replacement – Roads & Airports | | | 95 |
| | | | |
| WASTE REDUCTION | | | |
| Reaching 75% Diversion | $0 | | 1,525 |
| Reduced Consumption | $0 | | n/m |
| | | | |
| EMPLOYEE REIMBURSED MILES | $0 | | 94 |
| | | | |
| PUBLIC LIGHTING | | | |
| Replace HPS Streetlights with LED | $1,200,000 | $90,000 | 110 |
| | | | |
| TECHNOLOGY STRATEGIES | | | |
| Savings from reduced kWh – 3 strategies | Unknown | | 1,000 |
| | | | |
| ORGANIZATIONAL & BEHAVIORAL CHANGE | | | |
| Telecommuting  (telework policy) (2%) | Unknown | | 164 |
| EPP (environmental purchasing policy) | Unknown | | n/m |
| Outreach & Education (behavior change) | Unknown | | n/m |
| | | | |
| TOTAL | | | 30,814 |

n/m: not measurable and not part of the GHG in baseline inventory.

*  All estimates for reduction are calculated using a PGE factor of .46, which is representative of 2006, the lowest factor that PGE has released. Therefore, these are conservative estimates of savings.

**2015 GHG Reduction Goal:  13,346 metric tons.**

## Administrative and Tracking Actions

There are several actions that the County can take to increase the ability to measure progress and analyze options.

1. Develop a simple methodology for annual reporting on the key sources of GHG for County operations and facilities.
2. Develop best practices for any sector that is not going to be tracked and counted.
3. Switch to a FY reporting system for reporting GHG to eliminate the time spent revising data to fit into a calendar year.
4. Establish departmental systems for tracking the needed data on a regular basis, so that it is readily available for analysis and annual review.
5. Reshape the Climate Action Team and the Team's objectives into an interdepartmental team that will provide review and also strategize on continual progress and ideas.
6. Determine departmental responsibility for tracking and strategy.

These are summarized in Recommendations 8 and 9 in the Staff Recommendations section of this report.

In 2008, the California Air Resources Board released a state protocol for local government operations to use voluntarily to measure GHG emissions. The protocol is cumbersome and requires hundreds of hours of staff time to collect data that, in some cases, represents tiny portions of the resulting inventory. ICLEI used the state protocol to produce the County's Inventory, a process that took over one year. The most effective and least costly approach is to focus on a simpler method that will provide annual calculations of the GHG emissions for the larger sectors or sources of GHG and allow the County to monitor, track and adjust its progress. One of the goals of having a state protocol was to have the ability to compare jurisdictions to each other, however, there is now an understanding that jurisdictions are not similar enough to compare. Instead similar facilities can be compared among jurisdictions, such as waste water treatment plants, landfills, hospitals, etc.

It is possible that the Air Resources Board will provide a simpler protocol for calculating a GHG inventory or develop an online version in the future, that will be based on input from many cities and counties that have tested the current protocol. In that case, the County could shift to the new process. At this time, the main objective is to develop a more time- and staff-friendly approach to measuring the progress that the County is making and focus time and energy on identifying potential reductions and taking action.

A simpler protocol would not change the methodology of how greenhouse gas emissions are calculated but would provide a smaller list of what is counted. On a fiscal year basis, it is proposed that the County would count the following:

o Energy usage in County-owned facilities and facilities where the County pays directly for electricity and/or natural gas
o Energy usage in public lighting

- o Gasoline, diesel and natural gas usage in vehicles or other (anything filled from our pumps)
- o Fleet mileage
- o Waste disposal from County facilities and parks
- o Employee commutes (annual survey)
- o Employee reimbursed mileage from meetings and travel

The baseline completed by ICLEI includes several sectors that not only produce small amounts of emissions, but for which it takes time and effort to collect data. For instance, the state protocol requires that the County count and monitor all fire extinguishers and track refrigerants that are used by air conditioning service companies, whereas the CAT believes that establishing knowledge of refrigerant choices and best practices is a more useful approach.

The areas where we recommend NOT counting but instead developing a best practices approach are (with 2005 metric tons):

1. Refrigerants – vehicle, HVAC and fire extinguishers – (223 metric tons)
2. Septic systems – (66 metric tons)
3. Landfill emissions – (645 metric tons)
4. Water/Sewage transport – (104 metric tons)

The Facilities and Fleet Department is implementing a Utility Data Management System (UDMS) that will allow for easier access to all utility data for all facilities in the County. The Fleet Division is implementing Asset Works, a fleet data management system that will allow for easy reporting on fleet operations and will make some data easier to find and manage for GHG calculations. Both systems are anticipated to be fully implemented within FY 2010.

Other departments have improved the processes for collecting and maintaining data due to the effort needed to gather data for the inventory. The Climate Action Team will be instrumental in ensuring that each piece of needed data is properly collected and available.

## County Facilities

County facilities are maintained by four departments: Facilities and Fleet (General Fund facilities), Health and Hospitals, Roads and Airports, and Parks and Recreation. About five metric tons/year (significantly less than 1% of the County total) are attributable to Roads and Parks facilities. Roughly one third of the County facilities' GHG emissions is attributable to VMC and the Valley Health Clinics, and the balance, almost two-thirds, is attributable to other departments in both County-owned and leased facilities.

The County has made progress on implementing energy efficiency projects and avoiding large energy footprints for new buildings. The recently built Crime Lab was designed to meet LEED Silver standards, which included an energy efficiency component. The future VMC bed building is being designed to be LEED Gold, and a recent opening of a 1 MW large solar array on top of the new garage will supply some of the energy demand for the new bed building. FAF has identified another $23 million worth of projects that target energy efficiency and if these were all completed, they would reduce GHG emissions by over 7,800 metric tons. In the current fiscal

year, $1 million was allocated to pay for energy projects; at this rate of funding, it will take the County 23 years to complete the current list of energy efficiency projects.

As technology evolves in the energy sector, more energy savings opportunities and strategies will arise, but with these will come added costs. Worth noting is that the County is constantly exploring ways to not only gain energy efficiencies, but also ways to complete energy conservation measures more efficiently and to sustain these results over longer periods of time. One example is the wireless thermostats project at the SSA Julian facilities; using new, recently-available technology, the facilities were outfitted with energy management system level controls in a rapid and relatively inexpensive manner. This effort allowed for the buildings to operate more efficiently and to start participation in PG&E's Auto Demand Response program. This project earned a national award in the Smart Devices category at the Fifth Annual Building Awards during Connectivity Week held in Santa Clara earlier this year. Another example is the use of smart auto-diagnostics software which enables detection of otherwise undetectable faults before these become actual problems. This software package runs constantly in the background and utilizes complex program algorithms that cannot only detect hidden faults, but also has the ability to predict faults based on gradual changes in the performance of a building system. Tools such as this provide the sustainability soft wrenches that are required to maintain building systems operating efficiently and, as a result, they may reduce the GHG impacts of operating facilities.

HHS has identified some projects that are energy-related, which may need to be given more priority for funding. For instance, the idea of co-generation (combined heat and energy production) was considered more than once by the Board of Supervisors and a project was conceptually approved in September of 2002. This project has never been funded, but it was determined to be cost-effective to operate if the price of natural gas is between $2.00 MMBtu and $4.50 MMBtu and the price of electricity is between $0.11 kWh and $0.18 kWh. The costs of natural gas and electricity are currently within these parameters. A co-generation facility would save the County approximately $2.7 million and 1,473 metric tons of GHG annually.

A Renewable Energy Task Force (RETF) has identified a list of possible solar or renewable projects for the County and these options are being evaluated. If fully implemented, this list of renewable energy projects would reduce GHG emissions by an impressive 11,571 metric tons. A separate report to the Board of Supervisors on the RETF activities provides additional information on this potential.

### LEED for Facilities

The Board of Supervisors recently passed a set of Environmental Stewardship Goals that included the goal: "Ensure that 100% of County buildings are LEED certified and require LEED standards for construction in county land use jurisdiction." LEED is an internationally recognized green building certification system, developed by the U.S. Green Building Council, which provides third-party verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, $CO_2$ emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

A revised Green Building Policy for County-owned buildings includes requirements for LEED for new, renovated and existing buildings. The draft policy will be submitted to the Board of Supervisors for review in September, 2009. The County has shown leadership in design and construction of new buildings not only in designing for LEED but also in integrating unique energy saving features into new buildings. For instance, the Valley Specialty Center incorporated a sun-shading/daylighting system that bounces sunlight to the interior ceilings of the building, which adds light and reflects heat. The County participates regularly in Savings by Design, a program of PG&E that offers rebates for a building that exceeds Title 24 energy requirements by 20% or more.

There are two programs to consider regarding existing buildings: Energy Star Portfolio, a program of the EPA, and LEED for Existing Buildings Operation and Maintenance (LEED EBOM), a LEED certification process for making an existing building more energy efficient and green.

The Energy Star Portfolio allows an agency to track their energy use against the average for similar buildings. Buildings that are in the top 25$^{th}$ percentile of all buildings can be awarded an Energy Star rating (a score of at least 75 out of 100; an average building has a score of 50) and a score of at least 69 is required for LEED EBOM certification. A good start for a LEED EBOM Initiative would be to evaluate Energy Star scores.

The Portfolio approach offers the ability to manage many buildings in the Energy Star program. A LEED EBOM portfolio approach may provide some benefits for multiple County certifications. For instance, LEED EBOM has many requirements for policies and plans; these could be developed and submitted once rather than individually for each building.

To give reference to the difference between LEED programs, the new San Jose City Hall did not receive a LEED rating for New Construction (LEED NC) when it was built, but did recently receive a LEED EBOM rating. These are significantly different designations, which are often not understood by the public.

New County buildings are already required to be built to LEED NC standards and this requirement is anticipated to be included in the draft Green Building Ordinance for privately-owned, new buildings in the unincorporated area.

LEED EBOM, on the other hand, is for buildings that have been in operation for more than 12 months. It requires that the building meet energy, water and waste efficiency standards and that operational procedures be directed by strong policies, such as cleaning, purchasing and waste management. LEED EBOM is intended to help a facility manager make their building as resource efficient and environmentally friendly as possible. A LEED EBOM FAQ is included in the appendix.

To create a program for LEED EBOM within current budget constraints is challenging. Several steps can be taken that are not expensive and which will help to inform us on current status of buildings, educate staff on the process and inspire the County to take some initial steps. LEED

EBOM can be done incrementally, as funds are made available, with different actions being accomplished in different years until all requirements are met. The Climate Change and Sustainability Manager may take the following steps toward LEED EBOM during FY10:

1. Identify the highest priority buildings maintained by FAF based on energy usage, that is, establish the LEED EBOM portfolio.
2. Register the highest priority building for LEED EBOM on-line. This will give the County access to the forms and templates used to report for LEED EBOM. ($450)
3. Purchase at least three copies of the LEED EBOM reference guides. ($150/guide)
4. Work on Energy Star ratings for the selected set of buildings and prioritize energy efficiency and water conservation projects for these buildings in the capital projects process.
5. Do policy and procedural gap analysis to determine what is needed by the County to qualify for certification and identify needed resources (staff and/or budget).
6. Review the LEED EBOM portfolio process when it is released in 2010 to see if this is applicable to the County or if we would do better by rating individual buildings.
7. Implement a LEED EBOM sustainability program that will help preserve certification.

Even though facilities make up a large portion of the County's GHG emissions, the County has made steady gains in addressing energy efficiency. In order to achieve the needed reductions, funding for projects will need to be increased. Furthermore, in terms of making significant and sustainable gains in GHG reductions, the County must start implementing renewable energy projects and consistently fund the energy conservation program.

## Commuting

Having over 12,000 County employees drive alone to work contributes to greenhouse gas emissions as well as ozone and particle pollution. Reducing cars on the road would also help to benefit the public's health by decreasing air pollution, which has been linked to asthma attacks in children, increased risk of dying from lung cancer and increased risk of death from cardiovascular disease.

When the 2008 Commute Survey was done, employees expressed interest in having a commute program, more information, and a workplace that is supportive of alternative commute options. Some suggestions were unusual and unique to the County. For instance, the Social Services Agency has people doing the same work in different locations and a suggestion was made to allow for job switches so that people could work closer to home which would reduce the mileage for two individuals' commutes.

Employees are sensitive to subtle messages regarding commuting through seemingly unrelated actions taken by the County. These messages can either communicate support and agreement or be perceived as discounting the best of intentions. Examples include:

o Supervisor Ken Yeager biking to work on a regular basis (+)
o Managers who take transit, bike, carpool etc. or who speak highly of these options. (+)

- o Security improvements made to the West Wing of  70 West Hedding have, in some cases, made it more difficult for light rail commuters to access the building from the light rail stop.  (-)
- o Easily visible bike lockers and carpool spaces (+)
- o Waiting lists for these. (-)
- o Allowing for flex schedules to accommodate transit schedules (+)
- o Free Eco Passes or other benefits (+)

The commute survey sample showed that the overall miles per gallon (MPG) of employee-owned vehicles (in the "drove alone to work" sample) went up 1.2 MPG between 2005 and 2008. 31% of the employees switched vehicles between 2005 and 2008, increasing the average MPG from 23.5 MPG to 24.7 MPG. If we use this data to project changes in MPG by 2015, we can expect an increase of 2.4 MPG in the average employee-owned commute vehicle.

The County has provided a good commute benefit – the Eco Pass – for several years, but has not offered a commute program to encourage staff to choose alternative commutes. Therefore, the County can take action to improve commute patterns. Several promotional and educational actions were initiated at a minimal level this last year in anticipation of commuting being a large slice of the GHG pie. The following chart reflects three levels of possibilities for a commute program:

## 14.  Table of Commute Program Options

| | Business as Usual | Good | Better | Best |
|---|---|---|---|---|
| Public Transit | Free Eco Passes | Eco Passes - facilitate ease of obtaining a pass. Outreach spurt in early January. | Eco Passes | Eco Passes |
| | | Pretax Commute Passes for other transit options such as Caltrain, Ace Train, Highway 17 express. | Transit Subsidy up to $35* | Transit Subsidy up to $75** |
| | | Encourage Carpooling Between Buildings and Transit Centers. | ISD solution to arrange for carpools to meetings/between buildings. Allocate fleet vehicles for this use. | Study options for between County facility travel including a dedicated shuttle between buildings and transit centers. |
| | | Flexible schedules policy to allow for people to meet transit schedules. | Flex schedules. County actions that show support of transit (ie. Open door in East Wing for staff at commute times). | Flex schedules. County actions that show support of transit and removal of barriers, as perceived by employees. |
| | | | | |
| Carpools | some carpool parking spaces | Increase number of carpool spaces to match need and create ability to make adjustments easily. | Increase number of carpool spaces to match need and create ability to make adjustments easily. | Increase number of carpool spaces to match need and create ability to make adjustments easily. |
| | 511 carpool match-up | bi-annual online carpool event. | bi-annual online carpool event. | bi-annual online carpool event. |
| | | | | |
| Bicycling | | Bike Locker Survey - add bike lockers as requested, or provide secure bike storage at all facilities. | Bike Friendly Facility Certification for major County campuses. | Bike Friendly Facility Certification for major county campuses. |
| | | | | Bike fleet available at major campuses where employees would bike to lunch. |
| | | Bike to Work safety training classes. | Safety training, free helmets if people agree to bike to work. | Safety training, free helmets, % discount on bikes. |
| | | Support bike to work month. | Support bike to work month, set teams, run interdepartmental competition, provide food station for bike to work day. | Support bike to work month, set teams, run interdepartmental competition, provide food station for bike to work day. |

| | | | |
|---|---|---|---|
| | bike2work googlegroup for County employees. | bike2work googlegroup for County employees. | bike2work googlegroup for County employees. | bike2work googlegroup for County employees. |
| Lower GHG for People who Drive Alone | Average MPG for personal vehicles is 25 MPG. | Vehicles over 40MPG get preferred parking. | Work with Credit Union to Reduce Financing for SULEVs, EVs. | CU reduced financing costs, incentives to trade up to efficient car - free electric charging for EV for specific # of months. |
| Outreach | Internal page on Friendly Commutes | Expanded information on Internal Website. | Expanded website, posters, departmental presentations, transportation fairs at major campuses. | Expanded website, posters, departmental presentations, transportation fairs at major campuses. |
| | | Set up departmental commute champions. | Provide recognition to champions. | Have champions run departmental competitions. |
| | Spare the Air Day Challenge - passive approach | Spare the Air Day Challenge – actively promote and reward people who change commutes on STAD. | Spare the Air Day Challenge - actively promote and reward people who change commutes on STAD. | Spare the Air Day Challenge - actively promote and reward people who change commutes on STAD. |
| Workspace Changes | | Consider process to swap employees of similar work and classification to locations closer to home. | Analyze idea to set up satellite offices at major campuses. | Teleconference Centers in major County campuses to allow people to attend meetings in different locations. |
| | | infrastructure/training for setting up conference calls as needed. | infrastructure/training for setting up conference calls as needed. | infrastructure/training for setting up conference calls as needed. |
| Vanpool | | Encourage employee vanpools by offering information and support on setting one up. | Support new employee organized vanpools with limited time incentives (gas vouchers?). | Establish a vanpool program with County vans. |
| Shuttles | | Apply for grant funding for shuttles from Diridon to County campuses. | Apply for grant funding for shuttles from Diridon to County campuses. | Apply for grant funding for shuttles from Diridon to County campuses. |

\* Based on Intel's Commute Program.  \*\* Based on County of San Mateo's Commute Program.

Part of the strategy to reduce the impacts from commuting is simply projecting a decrease in metric tons based on an anticipated increase in MPG for employee-owned vehicles. If the County takes some action to help or encourage employees to upgrade to a more fuel-efficient vehicle, this MPG increase could be accelerated.

Predictions for GHG reductions are based on several factors:

1. Increasing the number of employees who take alternative commutes to 30% of the workforce. (currently 21%)
2. A consistent size for the workforce.
3. An average increase of 2.4 MPG for employee-owned vehicles.
4. No estimation of employees moving closer to the workplace has been projected, although this did occur between 2005 and 2008. This will be explored with more precision in the 2009 commute survey.

There is currently no commuter program or staff to support this program in the County. The Climate Change and Sustainability Program is exploring ways to create an internship program that would focus on these issues, but without additional help, there will not be sufficient staff time to work on these projects to any great extent.

## Fleet, Employee Miles

If the number of employee miles – both reimbursed and non-reimbursed – remains constant through 2015, we can expect a 9% decrease in greenhouse gas emissions, just based on the projected increase in MPG by employee-owned vehicles. This decrease represents 94 metric tons for the reimbursed portion of these miles, which are reported in the Inventory. The non-reimbursed miles will produce an equivalent decrease, although these miles are not documented in the Inventory.

The Fleet Division has worked for years to upgrade vehicles to more efficient and alternative fuel vehicles and has a policy for full fleet replacement every ten years. However, without funding, less fuel-efficient cars are driven longer and currently 34% of the fleet is outside the replacement criteria. If that 34% of the fleet is replaced by 2015, a rough estimate of GHG emissions savings is 807 metric tons, based on some rough assumptions: 10% of the replacements would be with hybrid vehicles with high MPG; the other 90% would be with vehicles that get an average of 9.5 MPG more than what they are replacing (a conservative educated guess), and mileage is constant. These replacements would use 91,621 less gallons of gasoline per year than the current models. More accurate reporting is needed to achieve better estimates, which may then reflect much greater GHG savings.

There are a variety of solutions to address funding annual vehicle replacements, including cash purchase, loan-debt finance and lease contract. Lease contracts can provide short term advantages to replace vehicles; although lifecycle costs may be greater than those resulting from cash purchase, leasing requires no upfront capital. Leasing vehicles where practical can provide modern, fuel efficient vehicles including hybrid and alternative fuel vehicles to make immediate GHG emission reduction impacts for the County fleet. Regardless of the funding mechanism, it remains a priority to consistently replace aged vehicles.

The Fleet Division has identified an additional strategy for reducing GHG in the fleet – adding Telematics, which would provide real-time location and performance monitoring of fleet vehicles by using a global positioning system and which would be fully integrated with the vehicles engine computers. Emissions and location information is transmitted wirelessly and made immediately available to the fleet manager. This system reduces emissions by discouraging unnecessary or excess vehicle driving and idling. Further, emissions problems can be assessed

immediately without having to put vehicles through invasive and costly tests. Identifying emissions problems immediately means a faster repair time, which keeps fleet vehicles on the road and also reduces the amount of GHG emitted. Telematics will link to the Asset Works data management tool and is estimated to reduce GHG emissions by 1,062 metric tons of $CO_2(e)$ annually.

Current Board of Supervisor direction to reduce fleet size may reduce or increase GHG emissions, depending on many factors. If reducing the fleet reduces mileage driven and gasoline consumed, it may reduce the size of the carbon footprint for the fleet but increase GHG from employee reimbursed miles. If reducing the fleet simply makes the fleet usage more efficient, it may have no impact on mileage or gasoline consumption and therefore no impact on GHG. Limiting the vehicles available in the fleet pool may limit the success of the commute program if employees then need to drive personal vehicles to work in order to accomplish County business.

In summary, there are three ways that the County can reduce the impacts of driving for business reasons. (1) upgrade the fleet vehicles; (2) implement Telematics; and (3) provide incentives for employees to purchase more fuel efficient vehicles, which would also reduce impacts from commuting.

## Waste and Recycling

A review of data from 2005 and 2008 indicated a fairly even level of waste disposal. However, early 2009 data shows increased service levels, with a current diversion rate for facilities at 22%. This is a simple diversion calculation based on service levels for both waste disposal and recycling and conversion factors from cubic yards to pounds. (formula: pounds of recycled or composted materials collected from county facilities divided by sum of all waste, recycling and composting materials collected from county facilities)

A recent process to select a waste and recycling hauler for the County included setting goals for waste diversion. The expectation is for the hauler to reach a 75% diversion rate by the end of their contract in 2015. Based on achieving this diversion rate and no overall increase in service, the estimate for GHG reductions is 1,525 metric tons. This can be achieved with our current contract if the County recycling program is given staff support, the recycling consultant contract is continued or enhanced and source reduction is actively promoted.

The GHG allocated to Solid Waste Disposal in the Inventory assessment represents the amount of trash collected from County facilities and the methane generated in the landfill from disposal of that waste. Recycling and composting are not reflected in the data, but these material streams benefit the environment and can reduce overall GHG. For instance, making an aluminum can from recycled aluminum requires 95% less energy than a can made from bauxite ore, the raw material used to make aluminum. Composting systems may produce GHG, but the use of compost can reduce overall impacts by significantly reducing water and pesticide use and replacing nutrients that would otherwise be replaced by the use of fertilizer, which has its own carbon footprint. None of the GHG produced during composting or recycling and none of the benefits of these processes are captured in the GHG inventory.

One of the larger sources of GHG related to waste is the emissions from trucks that haul waste. Therefore, reducing the number of miles that waste, composting feedstock and recycling are hauled, ensuring that trucks meet the highest emission standards and eliminating trips can each reduce overall GHG. Reducing the number of pick-ups also reduces idle time for the trucks, which can add a significant impact. These ideas were considered during the recent selection for a waste hauler and a new process that would cut down on the number of pick-ups needed was suggested as an innovative way to reduce impacts and cost. This will be tested in appropriate buildings during the coming year.

Waste disposal only represents 2% of the overall GHG emissions baseline for the County. This percentage under-represents the global impacts from materials consumption as it only counts the impact at the end of life of a product. In addition to addressing how products are chosen, more attention to encouraging source reduction will allow for a greater reduction of global GHG.

There is currently no dedicated recycling coordinator in the County; recycling implementation and review of service levels are currently being performed through a consulting contract paid for by FAF and managed by the Climate Change and Sustainability Program. Increased work in this area would warrant having an additional staff position that focuses on reducing waste in County facilities and encouraging reuse and source reduction.

## Green Information Technology (IT) Strategies

The Chief Information Officer (CIO) has established a departmental Green "IT" Team in the Information Services Department (ISD) and is in the process of expanding this team to include other departments. The Green "IT" Team has identified three strategies, each of which will help reduce greenhouse gas emissions as well as provide other environmental benefits.

1. Integration of technology that will reduce paper, printing and printers. This expands on the December 2008 memo from the County Executive's Office, which directed computer defaults to be set to print double-sided and for staff to reduce paper consumption. Consolidating to multi-functional devices that are energy efficient devices will save electricity, reduce costs, and decrease environmental impacts.

2. Technology that can reduce travel. The ability to web conference, access files remotely and make payments online are examples of technologies that could reduce travel and therefore, the greenhouse gas emissions related to vehicle use. The CIO is developing a pilot telecommuting policy for ISD that may be replicable in other departments. A focus group comprised of department representatives from other agencies and departments will be established to discuss this. Once this policy is reviewed and approved by the Executive Management and Board of Supervisors, other departments can use and/or adjust according to their specific departmental requirements. All policies will be reviewed by Labor Relations and other appropriate parties.

3. Consolidation and sharing to reduce number of devices and their associated energy consumption and cooling needs. Examples include server virtualization and an increased use of shared infrastructure, such as email, Document Management and collaboration solutions.

The CIO will refine and move forward with these strategies and integrate them into the County's 3-year Information Technology Plan. Energy and greenhouse gas savings can be estimated as the strategies are developed and individual projects are funded. Within technology, there is a potential to both reduce current greenhouse gas emissions and avoid future emissions as new innovative technology solutions are introduced.

A rough estimate of 1,000 metric tons of GHG emissions reduction is included in the overall summary of options and the table of recommendations. This figure does not include the reduction from telecommuting, which is its own line item.

### Street Lights

The Board of Supervisor set, as one of the Environmental Stewardship Goals: "Ensure that 100% of light fixtures owned and operated by the County, in buildings, on streets, and in parks are at the highest energy efficiency standard." The current standard for street lights in the county is high pressure sodium (HPS). The main benefits of LED replacement are lower energy consumption, longer life, better color reproduction, less light diffusion, and no mercury waste. As for projects, the Department of Roads and Airports has already upgraded all traffic lights and all pedestrian lights to LED. Cities such as Palo Alto and San Jose are working on pilot streetlight replacement programs. Palo Alto recently replaced 9 HPS fixtures with LED and expects to see a 40% reduction in electricity use for these lights. The city is also looking into dimming technology which, although experimental, could produce more savings.

Similarly, San Jose has just started a pilot streetlight replacement program that replaces 115 low pressure sodium streetlamps with low wattage LED fixtures. These LEDs will be placed on a similar experimental dimming and control system as Palo Alto's, which can control brightness, monitor status and energy consumption, and allow a single point of control for all of the LED streetlamps. San Jose estimates a 40-60% annual energy savings mostly in dimming and slightly in wattage reduction. Beyond San Jose, other jurisdictions are testing LED street lights to ensure that they meet the safety standards and lighting needs that are required.

If the County were to replace all its 1,300 high pressure sodium street lights with LED, it could possibly save 500,000 kWh and 110 metric tons of GHG per year. The switch would cost about $1.2 million and have a payback of 10+ years. This action would require further study by the Department of Roads and Airports as replacements within the County Lighting Service Area would need to meet specific state requirements.

### Water

At this time, sufficient data is not available to include an in-depth analysis of water usage and options for reductions. As noted earlier in this report, water and energy use are related and reducing water consumption will reduce GHG, even though this is not reflected in the Operations and Facilities Inventory. The following gives a brief overview of the items which should be addressed in a complete action plan for water consumption.

### Water Conservation

Water conservation is the easiest, most cost-effective, and most efficient way to reduce water consumption. With California in its third year of drought, reservoir storages at historic lows and a receding Sierra Nevada snowpack, the time to conserve water is now. The Santa Clara County Water District estimates that of all potable water saved in a given year, 62% is attributed to water conservation and 38% is attributed to recycled water. Unlike recycled water, water conservation requires zero conveyance, treatment or distribution costs but rather targets a behavioral change. This behavioral change can be made immediately as opposed to recycled water which requires more extensive dual-plumbing and pipeline installation.

The water use in Santa Clara County government facilities has risen in the past few years, and while there is certainly a need for a behavioral change, some measures are being taken to reduce the water consumption at our buildings. One measure is implementing xeriscape – a low water consuming landscape design that incorporates native drought resistant plants, a water retaining soil base of mulch and compost and more efficient irrigation to achieve reduced water use, less maintenance and a pesticide free site. A pilot xeriscape project at 70 West Hedding is being pursued – an action that could reduce water used for irrigation at that facility by 80%. Once this project is shown to be successful it can be expanded and implemented at seven other county facilities.

### Recycled Water

Recycled water is reclaimed water from the sewer system that is treated to a near potable state and distributed to customers for purposes of irrigation, chiller tower use, and other processes not requiring potable water. Recycled water uses separate lines for transport and distribution, which are known as "purple pipes." The use of a separate system requires dual plumbing to be installed in buildings using recycled water.

In the past few years, California has experienced an increased number of droughts and a decrease in the Sierra Nevada snowpack. This snowpack feeds the Sacramento-San Joaquin River Delta where more than 50% of Santa Clara County's potable water supply is collected. Extrapolated data suggests that if trends remain constant, by 2060 there could be a decrease in the Sierra Nevada snowpack of almost 33%. The use of recycled water would create a drought-proof, sustainable water supply which could reduce GHG emissions by lowering the energy required to pump water from the Delta, decreasing the energy used to make that water potable, and reducing our need for the limited snowpack resources feeding our water system.

A decrease in snowpack equates to an increase in energy usage. The snowpack gravity-feeds the Delta, a process that requires no extra energy use in conveyance or pumping. If the snowpack were to melt, other energy-intensive efforts to acquire potable water would have to be explored, such as desalination, local purchasing, and importation. Such methods would involve, both financially and environmentally, higher conveyance and pumping costs and much higher treatment costs.

Energy-wise, treating water to recyclable standards can, according to the State of California's Energy Commission, potentially use 13 times less energy than treating water to potable quality.

Recycled water also reduces the distance for source and conveyance, a process which accounts for 59% of the energy used for water-related purposes in Santa Clara County.

### Graywater

As defined by the California Plumbing Code, graywater is wastewater from bathtubs, showers, bathroom wash basins, clothes-washers, and laundry tubs. This water accounts for almost 60% of all household water use. Graywater, unlike blackwater (sewage), contains relatively few harmful pathogens and can be reused for some non-potable applications without going through high energy consuming wastewater treatment facilities. California's current plumbing code restricts certain uses and has stringent requirements for installing graywater systems, although some leniency was added in early August 2009 that allows for simple laundry and single fixture graywater systems to be installed without a permit. The Santa Clara Valley Water District has convened a committee to review the new code and to develop a local ordinance that addresses local agency concerns about the more lenient requirements.

Irrigation accounts for a significant amount of all office building related water use in the County of Santa Clara and is an accepted use of graywater. Using graywater would contribute to water conservation efforts by decreasing facility water usage, thereby reducing the energy and monetary cost of water treatment and transport. The cost of retrofitting large facilities to capture graywater for use is prohibitively expensive in most cases but smaller residential-sized buildings might benefit from such a system.

In county facilities, graywater drawn from sinks, jail facility showers, laundry, and clothes washers, and future bicycle-friendly facility showers could reduce the use of potable water for irrigation and can be considered in a future water plan, along with increasing the use of recycled water and implementing technology and behavior changes to increase conservation.

All of these options will be considered more comprehensively in a future Water Reduction Plan.

## Organizational Changes

### Telework (Telecommuting) and Alternative Schedules

Many cities and counties offer telecommuting options and alternative schedules for employees and experience the benefits of a healthier and happier workforce, increased production and reduced environmental impacts. Within the County of Santa Clara, there are Departments that provide pilot telecommute programs under the terms of labor agreements. The County, with a few exceptions, does not offer this option on a formal basis, nor does it have a policy and program to support telework. A formal policy would provide this option within a structure that addresses client, service and operational needs.

Alternative work schedules, such as "4/10" (eight days of 10 hour each in a two week period) "9/80" (nine days/eighty hours in a two week period), are also not available in some departments. In the 2008 commute survey, many employees expressed desire to work alternative schedules or to work at home. ISD has begun the process of internally developing a departmental Telecommute Policy and Program and will take steps to ensure that the interests of the Employee Services Agency-Risk Management Department and the Administration are addressed. Given the

potential needs of a telecommuter to be able to connect to the network from home and to access email, records and files, ISD is a good choice to explore the issues, costs and interests related to moving forward on telecommuting.

For purposes of the GHG reductions, we have estimated 2% of all employees telecommuting one day a week. This reduces the impacts from commutes for those days, which can be calculated based on average commute impacts. 2% is a very conservative estimate based on this option being slowly introduced across departments and represents a savings of 164 metric tons of GHG.

No estimate was included in table for allowing for alternative schedules, although for each 9/80 schedule employee, a savings of 26 pounds of GHG per day not commuting to work (or 1,179 pounds of GHG per year) reduction can be estimated. Each 4/10 schedule employee would save 2,358 pounds of GHG per year. Moving the County towards increased flexibility on both alternative schedules and telework will help reduce GHG.

### Setting and Supporting Priorities

In order to solve the challenging problems, make substantial reductions to GHG emissions and prepare for the future changes that are eminent, a fundamental change in how we think about and fund GHG reductions is needed. This report puts a variety of reduction possibilities on the table, some of which are basic building projects, some support education or behavior change and some require a shift in priorities. These are initial actions that can be taken to support change:

1. Establish a new Board Policy that allows utility savings resulting from approved energy, water, and waste projects to accrue to Energy Holding Accounts, consistent with existing BOS Policy 4.14. This will create an expanding source of funding for additional projects that will help the County meet its reduction goals.

2. Strengthen evaluation criteria in Board Policy 4.11 for energy and water savings and GHG reductions and require that the Annual Administrative Capital Project review process prioritize funding recommendations for BOS approval according to these criteria.

3. Increase interdepartmental collaboration and intradepartmental group problem solving through supporting innovative ideas and groups that want to explore new ways of addressing ongoing problems, such as climate change.

4. Take advantage of the expertise that exists in the County when approaching topics that are of wide interest. For instance, how landscaping is handled is of interest to Planning and Development, Integrated Pest Management, Integrated Waste Management, Climate Change and Sustainability and all of the departments that do their own landscaping. Interest and expertise in increasing reuse or proper environmental disposal methods are held in Environmental Health, Integrated Waste Management, Climate Change and several departments but all property disposal is governed by Procurement. The County could identify and then either consolidate overlapping efforts or set up interdepartmental teams to address areas of mutual interest.

### Behavioral Changes

Many of the targeted actions require behavioral changes. For instance, in order for the commuting program to be successful, employees need to make different commute choices. For instance, employees need to know to turn off their computers at night – and then do this regularly. More understanding of the need for recycling and more participation is needed.

Behavioral changes need both support from the top and interest and agreement from peers. A real culture change can occur if everyone in the County from the Board of Supervisors on down consistently sets expectations that things be done a certain way. As noted in the commute section above, subtle messages are powerful.

In order to educate employees about their options, the Behavior Change and Education Working Group of the CAT will require the ability to communicate to all employees through the use of email, newsletters, website and posters, for starters. Their efforts and ideas have shown up in the *Comline*, the Employee Wellness Fair and in messages on check stubs. A small Climate Action section on the County's intranet was created for employees. Continued support from the leadership of the County organization is critical to the continued success of these efforts.

To be effective, champions for climate action, biking to work, choosing alternative commutes, being energy and water efficient and reducing waste need to exist in different departments. The places where green teams have been set up have been successful at providing specific suggestions for the CAP or to achieve certain goals. For instance, the memo regarding reducing paper usage inspired the Clerk of the Board to establish a green team, which then identified all the ways in which paper usage could be reduced, evaluated the best options and moved ahead. ISD began a green team to discuss technology solutions for going green. An interdepartmental facilities management group was started to broaden the discussion to all the departments with facility responsibilities.

Outreach, educational efforts and cultivating a change in culture or behavior change take significant amounts of staff time. To the extent that the County wants bold action, efforts to create change need to be supported with staff. Otherwise, efforts to create change will come in small increments as can be accommodated by the Climate Change and Sustainability Program and the Behavior Change and Education Working Group volunteers.

### Policy Needs

The need for revising or developing policy was discussed in the early Climate Action Team (CAT) meetings and its working groups. Following is a discussion of the policies identified by the CAT.

### Environmentally Preferable Purchasing Policy

Greenhouse gas emissions are closely tied with our consumption patterns; changing how and what we purchase is a strategic approach to directly and indirectly reduce GHG emissions. When the CAT first met last August, they identified developing an Environmentally Preferable Purchasing Policy (EPP) as a priority for the County. The Department of Procurement is responsible for producing the EPP. The CAP assumes a pattern of continual improvement to the EPP and purchasing habits and estimates significant savings of GHG metric tons by 2015 based

on changed patterns of consumption. Of these, purchasing items that are rated as Energy Star, and other efficiency purchases for energy and water will reduce GHG emissions from the County's official footprint. Other reductions, which help globally although not counted in our inventory, are attributable to actions such as increasing the recycled content percentage in paper, reducing the use of toxic products, using rechargeable batteries (cutting down on the energy needed to manufacture new and recycle or dispose of batteries), and purchasing of green furniture and partitions, etc.

### Green Building Policy

This policy is under revision to strengthen requirements for energy and water efficiency in buildings sited, designed, constructed, operated, maintained and removed by the County. This is a proactive strategy to ensure that new square footage is as efficient as possible and will also affect existing buildings, renovations and tenant improvements in leased spaces.

### Fleet Procurement Policy

The Ten Year Fleet Plan (Board Policy 4.20) calls for fleet vehicle replacement to be standardized so that the majority of fleet vehicles are replaced every ten years, cutting down on operating and maintenance fees and optimizing the efficiency. Board Policy 7.11, Vehicle Procurement – Low Emission Vehicles, requires that the County give preference to the lowest emission vehicles available. The current fleet is 34% out of compliance with replacement criteria but when replaced, new vehicles are selected within the criteria of Board Policy 7.11.

The Board of Supervisors signed the Bay Area Climate Compact, which lists as a goal: "Increase the number of zero emission and other advanced ultra-low emission light duty vehicles to 10% of municipal fleets by the end of 2013, and to 25% by the end of 2018." One of the Environmental Stewardship Goals is "Ensure that 100% of public fleet vehicles are electric, hybrid electric or run on alternative fuels." The County also signed the Plug In Resolution in 2007, which supports the purchase of electric and hybrid electric vehicles. These goals will be considered in any future fleet purchases.

### No Idling Policy

A No Idling Policy would simply restrict the amount of time that an employee or visitor to any of the County buildings can leave their vehicle running. This reduces air pollution around buildings as well as GHG emissions. Signs would be posted at loading zones and in places where idling occurs regularly. For employees, idling would not be allowed in County vehicles regardless of where they are stopped and for visitors, idling would not be allowed on County property. This policy ties into the efforts by the County Fleet Division to utilize Telematics in their vehicles.

# Staff Recommendations for 2015 Targets

The following recommendations are a subset of the options discussed in the preceding section, which, if fully implemented over the next five years will bring us to the target of a 10% decrease in GHG from the 2005 baseline. This assumes no significant increases in total numbers of employees and that resource demands from new square footage are offset by equivalent energy and water reduction projects or renewable sources.

## Policy and Procedural Development and Organizational Changes

The following 12 recommendations are related to policy and programmatic changes. Numbers 5 and 6 will result in measurable GHG reductions as well, although not enough specific information is available to make calculations for the IT strategies yet.

**Already underway by departments:**

1. Complete and implement the Environmentally Preferable Purchasing Policy.
2. Revise and implement the Green Building Policy for County buildings.
3. Implement the Utility Data Management System for all facilities and the Asset Works for all fleet vehicles.
4. Complete the telecommuting policy and program; roll out to all interested departments.
5. Integrate the three Green IT Strategies into the Countywide Three-Year IT Plan.
6. Establish a 75% waste diversion goal for facilities and parks. (GHG reduction of 1,525 metric tons)

**New Actions**

7. Develop a No Idling Policy.
8. Develop a simplified GHG calculation process for FY, with 2009/10 being the first one to report. Establish data tracking systems in affected departments.
9. Develop Best Practices guidelines for refrigerants, septic systems, water transport and closed landfill emissions, as needed.
10. Establish a new Board Policy that allows utility savings resulting from approved energy, water, and waste projects to accrue to Energy Holding Accounts, consistent with existing BOS Policy 4.14.
11. Establish a LEED EBOM program for facilities that can be implemented incrementally as funding allows.
12. Develop a long term water reduction plan.

## Actions which result in specific GHG reductions

The following chart includes specific projects that will result in GHG reductions that are measurable. Telecommuting can require significant IT investments if the program is expanded beyond the informal approach that exists in some departments. We are not able to identify specific costs at this time for that option, so have included it in the last section.

## 15. Identified Opportunities to Reduce GHG in County Operations and Facilities

| Action | GHG Reductions | Additional Cost | Source of Funding | Responsible Department |
|---|---|---|---|---|
| **Easy/ no additional cost actions** | | | | |
| Funded Energy Conservation Projects | 1,019 | None | Already funded | FAF |
| VMC retrocommissioning | 365 | None | Already funded | HHS |
| Reaching 75% waste diversion | 1,525 | None | Part of new waste hauler agreement | FAF, all! |
| Employee reimbursed miles | 94 | None | None needed | none |
| **Total** | **3,003** | | | |
| **Grant or Funding Opportunities** | | | | |
| Commute Program | 3,038 | Unknown | | ClimateC |
| Telematics | 1,062 | $1,484,400 | | FAF (Fleet) |
| Prioritized RETF List | 7,334 | $92,820,000 | | FAF, HHS |
| VMC Co-Gen | 1,473 | $30,235,919 | | HHS |
| Street Light LEDs | 110 | $1,200,000 | | Roads |
| **Total** | **13,017** | **$125,740,319** | | |
| **Higher or Unknown Costs** | | | | |
| Telecommute | 164 | Unknown | | ISD |
| Fleet Replacement – Roads | 95 | Unknown | | Roads |
| Green IT Infrastructure | 1,000 | Unknown | | ISD |
| Fleet Replacement | 807 | $14,000,000 | | FAF (Fleet) |
| Non-Prioritized RETF List | 4,868 | $61,600,000 | | FAF |
| Future Energy Conservation Projects | 7,860 | $23,247,956 | General Fund, Resource Fund | FAF |
| **Total** | **14,793** | **$98,847,956** | | |
| **Grand Total** | **30,814** | **$224,588,275** | | |
| **2015 GHG Reduction Goal** (metric tons) | **13,346** | | | |

**Additional Recommendations relating to quantitative GHG reductions:**

13. Continue to pursue grant funding possibilities and Renewable Energy Task Force recommendations to identify opportunities to fund any of the following: commute

program, telematics, renewable energy, co-generation, LED street lights, green technology projects and energy and water efficiency projects.

14. At the next Annual Fleet Replacement decision, consider funding solutions including vehicle lease contracts in order to accelerate fleet replacement. By leveraging modern technologies and alternative fuel vehicles, MPG per vehicle will increase and emissions will decrease.

15. Add GHG reduction and energy and water efficiency criteria to the next round of Capital Projects concept paper requirements and review, identify and fund enough energy efficiency projects to enable the County to reach the 2015 goals.

16. Each year, upon review of the GHG emissions data from the previous year, adjust the Capital Projects list priorities to ensure that efficiencies are being implemented at a rate that is congruent with reaching our goals.

## Strategy for Long Term Success – the 2050 Goal

Creating the plan for the short term goal of 2015 has allowed us to consider implementing some basic programs or approaches; increasing the priority for energy efficiency projects, renewable energy projects and fleet upgrades; and beginning a transformational shift in how we do business. When we put planning into the perspective of aiming for an 80% reduction in GHG, the shift from business-as-usual becomes the highest priority and a necessity for long-term success.

The Plan for 2015 reflects a path that the County of Santa Clara has been treading for many years – efficient, green, well-managed – and simply accelerates to meet the GHG reduction goals. The path for 2050 requires not only acceleration, but also a more sustainable approach. The 2015 plan laid out the following four organizational changes:

1. Establish a new Board Policy that allows utility savings resulting from approved energy, water, and waste projects to accrue to Energy Holding Accounts.
2. Create new evaluation criteria that include energy and water savings and GHG reductions for the Annual Administrative Capital Project review process.
3. Increase interdepartmental collaboration.
4. Fully utilize the expertise available within the County.

In addition to these, creating a culture of innovation, where new ideas are embraced and the possibility of failure is considered a learning experience rather than a fundamental flaw, will encourage staff to become more proactive and enthusiastic about moving into a new paradigm. Many departments are represented on the CAT by people who care deeply about the environment and agree that the County needs to support change, but who find the barriers to change to be significant. The County needs to move past barriers and start looking at ways to seriously make shifts towards sustainability.

This CAP identifies enough projects to reach a 20% reduction, but many of these are expensive projects and will require some creative thinking to just determine how to move forward on the

list we have, while identifying the next set of energy efficiency projects. Yet, a change in perspective will help frame these projects as investments – with a return on investment that would make most financial people very happy indeed.

GHG emissions will also be affected by the economy – with decreases evident now because of reduced travel and expenditures and increases expected as the economy picks up. Restoring operations with economic recovery will add GHG to our inventory and targets will need to be re-evaluated on a yearly basis to ensure that the impacts don't offset the reductions.

And finally, many of the reductions we will achieve between now and 2050 will come from actions outside of our influence. We will benefit from increased MPG requirements on all vehicles, more stringent Title 24 requirements and future innovation in building design and maintenance. Increased transit options and new technology will also help us meet the targets.

Overall, the County of Santa Clara will travel along the road to reduced GHG with other jurisdictions, learning from some of their efforts and taking the lead in others. It is important to continue the discussion on climate action and to ensure adequate funding and staffing is allocated to these efforts.

# Appendix A: Data Sources

All greenhouse gas calculations in this report except for waste were determined using numbers from the September 2008 *Local Government Operations Protocol: For the quantification and reporting of greenhouse gas emissions inventories* (LGOP) in conjunction with emissions factors supplied by Pacific Gas and Electric. The LGOP report can be found at http://www.arb.ca.gov/cc/protocols/localgov/pubs/final_lgo_protocol_2008-09-25.pdf. Waste emissions were calculated by ICLEI using the WARM model developed by the Environmental Protection Agency.

## Facilities and Energy

Most of the facilities data in this section comes from Santa Clara County facilities energy usage data supplied by Lin Ortega from Facilities and Fleet. This data provided natural gas (in Therms) and electricity (in kWh) use for county facilities.

The energy intensity data for the national average office, hospital and public safety building was taken from the quadrennial 2003 *Commercial Buildings Energy Consumption Survey* conducted by the Energy Information Administration which can be found at http://www.eia.doe.gov/emeu/cbecs/.

Square footage data was supplied by Facilities and Fleet and Health and Hospitals. This data was correlated to fit with the facility energy usage data. Further, the energy intensity for the Valley Medical Center was supplied by Health and Hospitals and was compared to Energy Star hospitals from http://www.energystar.gov.

It should be noted that the facilities represented in the graphs are strictly *maintained* by the agency reported. Although FAF facilities appear to constitute two-thirds of all county GHG emissions, some of these buildings are occupied by other departments, such as Health and Hospitals, but are maintained by FAF.

All FAF energy conservation projects were either listed in the Capital Improvement Plan or supplied by the Manager of Intragovernmental Support Services or the Assistant Manager of Building Operations. The Health and Hospital Co-Generation project data was taken from the 2002 *SCVMC Co-Generation Study Addendum* which evaluated three co-generation options for the Valley Medical Center.

For the LEED EBOM FAQ see Appendix C.

## Commute Data

Most of the data in this section comes from the 2008 Initial Commute Survey as opposed to ICLEI's survey because ICLEI's survey had a much smaller sample size. The Initial Commute Survey was taken by 1,919 Santa Clara County employees between August 26 and October 31, 2008. The ICLEI survey was taken by 358 employees starting on December 3, 2008.

The VTA Survey was administerd by the Valley Transportation Authority in 2009 and had 896 employee respondents. This survey was used to aquire data on current ecopass use. Ecopass trend data was still taken from the Initial Commute Survey.

Employee count is the authorized permanent employee number in the Final Budget Book for the year. For 2005, the number is 15,031 – for 2008, 15,245. The number that ICLEI used is slightly smaller for 2005, 14,810, which was a projected number for 2005.

Some of the actions in the commute program chart were adapted from currently running commute programs throughout the bay area.

Employee drive alone vehicle MPG and statistics on commute decisions were all gathered from the Initial Commute Survey.

## Fleet and Reimbursed Mileage Data

Fleet data was provided by the Fleet Services department by the Fleet Manager. This data was given in three lists – two containing vehicle miles traveled in 2005 and 2008 and one containing fuel consumption for the fleet in 2005. ICLEI used the fuel consumption data from 2005 to establish our baseline inventory. Since fleet fuel consumption data was not available for 2008, a trend in GHG emissions could not be established.

The Roads and Airports department controls their own fleet and their data was provided directly by them.

Employee reimbursed mileage was obtained from the Office of Budget Analysis and the unreimbursed mileage was calculated based on responses in the Initial Commute Survey.

## Waste and Recycling Data

Waste calculations are based upon waste hauler reporting data from Allied Waste for 2005 and 2008. This data was scrutinized by Richard Gertman, the County's waste and recycling consultant, who corrected any reporting errors. GHG calculations were done by ICLEI and extrapolated to 2008 waste tonnage levels to estimate emissions for 2008. ICLEI calculated waste emissions based upon the WARM model developed by the EPA in conjunction with default waste characterization data provided by the *CIWMB 1999 Waste Characterization Study*. The WARM model can be found at http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html. The Waste Characterization Study can be found at http://www.ciwmb.ca.gov/WasteChar/BizGrpCp.asp.

## Other Sources and Sectors

All emission calculations for other sources and sectors are from the 2005 baseline inventory by ICLEI, which was based upon data provided by various departments.

## Streetlight Data

All background information regarding LED streetlights versus high pressure sodium streetlights was compiled based upon multiple online articles and publications.

Information regarding Palo Alto's streetlight replacement program was taken from the City of Palo Alto Website and the PowerPoint presentation found there titled *LED/Induction Streetlight Pilot Presentation.* This presentation can be found at http://www.cityofpaloalto.org/environment/news/details.asp?NewsID=1311&TargetID=59.

The Sustainability Manager for the Department of Transportation for the City of San Jose supplied the information on San Jose's streetlight pilot program. More information on this program regarding energy savings was taken from a Fortune Magazine article titled *San Jose streetlights get smarter* and can be found at http://money.cnn.com/2009/04/24/technology/street_lights_echelon.fortune/.

Specific Santa Clara County information was given by the Deputy Director of Infrastructure Development in the Roads and Airports Department.

### Water Data

Data regarding energy used for water related purposes was supplied by the California Energy Commission in a 2007 report titled *Water Related Energy Use in California* – a report which can be found at http://www.energy.ca.gov/2007publications/CEC-999-2007-008/CEC-999-2007-008.PDF.

California natural gas and electric data was pulled from the Energy Information Administration at http://www.eia.doe.gov/ while information on thermoelectric power production was taken from a 2005 article by the United States Geological Survey. The article can be found at http://pubs.usgs.gov/fs/2005/3051/.

Specific water use for government facilities was supplied by Facilities and Fleet who acquired it from the San Jose Water Company.

Data on the pilot xeriscape program at 70 West Hedding was provided by the Integrated Pest Management Manager and the Santa Clara Valley Water District 2007 Irrigation Technical Assistance Program Report.

Snowpack data was taken from a presentation hosted by the United States Forest Service website and can be found at http://www.fs.fed.us/psw/topics/climate_change/meetings/climate_wrksp/CW2008/Hunsaker.pdf Figures on recycled water usage and savings were found in the California Energy Commission's 2005 *California's Water – Energy Relationship* report. Information on graywater systems was found at http://www.toolbase.org/Technology-Inventory/Sitework/greywater-reuse.

### Changes from 2005 to 2008

All trend data was calculated as mentioned above using the most current data possible. The formula for calculating GHG was adapted from numbers in the LGOP report and from PG&E emissions factors. The software that ICLEI used to determine the baseline emissions, *Clean Air and Climate Protection Software 2009* (CACP), was not used to calculate emissions for the trend

data but the same methodology was applied using Excel. Although trend data is based upon a few rough estimations, its purpose is to estimate changes in GHG emissions from 2005 to 2008.

## Appendix B: Methodology

The 2008 LGOP report for calculating greenhouse gas emissions was developed by a partnership consisting of the California Air Resources Board, California Climate Action Registry, ICLEI and the Climate Registry. Any local data available, such as PG&E emissions factors, was used in conjunction with this report to calculate GHG emissions. Of the greenhouse gases, the most prevalent three – carbon dioxide ($CO_2$), methane ($CH_4$) and nitrous oxide ($N_2O$) – were used in calucating GHG for the ICLEI baseline and this report.

### Electricity and Natural Gas Emissions

Calculating GHG emissions requires four emissions factors and two global warming potential factors. The first two emissions factors for electricity and natural gas are supplied by PG&E; the natural gas factor remains constant but the electricity factor varies year by year depending on the generation method of the electricity they buy. The following shows the PG&E emissions factors from 2004 to 2008.

| Year | Electricity kWh to lbs CO2 | Natural Gas Therms to lbs CO2 |
|------|----------------------------|-------------------------------|
| 2004 | 0.566 | |
| 2005 | 0.489 | |
| 2006 | 0.456 | 11.64 (constant) |
| 2007 | 0.636 | |
| 2008 | 0.636* | |

\* The conversion factor number for 2008 is expected to be lower than this, but until PGE releases the verified number in 2010, we are using the 2007 factor for estimating 2008.

Although the next two factors for $CH_4$ and $N_2O$ also vary by year, they remained almost constant between 2000 and 2004 and were assesed at the 2004 levels of 0.029 lbs/MWh and 0.011 lbs/MWh respectively.

Global warming potential factors are numbers that weight $CH_4$ anf $N_2O$ emissions with respect to $CO_2$ emissions. Since $CH_4$ is 21 times as potent and harmful as $CO_2$, its global warming potential is 21. The same is true for $N_2O$ which has an even higher global warming potential of 310. When multiplied by these factors, the units are quantified in metric tons of $CO_2$ equivalent – $CO_2(e)$. This way, all emisisons are normalized to $CO_2$ emissions and can be combined into a total GHG emisisons number of $CO_2(e)$.

An example for calculating electricity emisisons is as follows, with .46 being the conversion factor used to calculate GHG emission savings for future projects:

$$GHG\ (metric\ tons\ CO_2(e))$$
$$= electric\ consumption\ (kWh) \times PG\&E\ Emissions\ Factor\ \left(\frac{0.46\ lbsCO_2}{kWh}\right)$$
$$\times conversion\ \left(\frac{metric\ tons}{2204.6\ lbs}\right)$$

$$GHG\ (metric\ tons\ CO_2(e))$$
$$= electric\ consumption\ (kWh)$$
$$\times PG\&E\ Emissions\ Factor\ \left(\frac{0.000029\ lbsCH_4\ or\ 0.000011\ lbsN_2O}{kWh}\right)$$
$$\times conversion\ \left(\frac{metric\ tons}{2204.6\ lbs}\right)$$
$$\times global\ warming\ potential\ \left(\frac{21\ metric\ tons\ CO_2\ or\ 310\ metric\ tons\ CO_2}{metric\ tons\ CH_4\ or\ metric\ tons\ N_2O}\right)$$

Once added together, these equations give total metric tons of $CO_2$(e).

Natural gas emissions were calculated almost exactly the same way. The emisisons factor for $CO_2$ was supplied by PG&E while the emissions factors for $CH_4$ and $N_2O$ come from the LGOP report and are 5 g$CH_4$/MMBtu and 0.1 g$N_2O$/MMBtu respectively. For natural gas the global warming potential factors stay the same. These calculations were used to estimate trend data for facilities and also GHG reductions for many of the items on the summary table of potential greenhouse gas reductions.

Like a kWh and a Therm, a Btu is another measurement of energy. Btus are mostly used as an alternate measurement for natural gas but are also used to combine natural gas and electric emissions into one factor. In the case of the Valley Medical Center, Btus per square foot represents a fusion of electric and natural gas emissions per square foot. 100,000 Btus are equivalent to 1 Therm. 3,412 Btus are equivalent to one kWh. Therefore, if a building used 1 Therm of natural gas and 1 kWh of electricity then that building would be consuming 103,412 Btus.

### Motor Vehicle Emissions

GHG from commute, reimbursed miles, fleet replacement, telematics and roads and air fleet replacement were all calculated using the following methods, although different assumptions were made.

Emissions factors for $CO_2$, $CH_4$ and $N_2O$ were taken from the LGOP report. Unleaded gasoline has an emissions coefficient of 8.81 kg$CO_2$ per gallon while diesel fuel is higher at 10.15 kg$CO_2$ per gallon. While $CO_2$ emissions can be quantified in this way, $CH_4$ and $N_2O$ emissions rely upon vehicle miles travelled (VMT) and vehicle age.

For fleet emissions, ICLEI broke the data down by vehicle year and type and used emissions factors from the LGOP report combined with VMT data supplied by Facilities and Fleet. A sample calculation for GHG emissions from 2005 unleaded gasoline passenger fleet vehicles is as follows.

$$GHG \left( metric\ tons\ CO_2(e) \right)$$
$$= unleaded\ fuel\ emissions\ factor \left( \frac{8.81\ kgCO_2(e)}{gallon} \right)$$
$$\times fuel\ consumed\ (gallons)$$
$$\times conversion \left( \frac{metric\ tons}{1000\ kg} \right)$$

$$GHG \left( metric\ tons\ CO_2(e) \right)$$
$$= CH_4 or\ N_2O\ 2005\ emissions\ factor \left( \frac{0.0147\ gCH_4\ or\ 0.0079\ gN_2O}{mile} \right)$$
$$\times VMT\ (miles)$$
$$\times conversion \left( \frac{metric\ tons}{100000\ g} \right)$$

Once added together, these equations give total metric tons of $CO_2(e)$.

In order to calculate fleet replacement, a few assumptions were made. The fleet data collected for 2008 was not accurate enough to determine an average fleet MPG, so a presumed 20 MPG was used. This assumption was made based upon excluding major outliers in the fleet data and taking the median for MPG. This assumption is an educated guess but cannot be confirmed. The second assumption was that VMT does not increase through the vehicle replacement period. And, the third assumption was that 10% of replaced vehicles would be replaced with vehicles getting 27 MPG greater and the other 90% would be replaced by vehicles getting 9.5 MPG greater. The 27 MPG increase is based upon the Toyota Prius which gets an average EPA estimated 47 MPG. The 9.5 MPG increase is based upon other hybrid and fuel efficient vehicles getting an approximate average of 29 to 30 MPG.

Emissions savings were estimated by calculating the emissions difference between current fleet vehicles and replaced fleet vehicles. To calculate emissions, the following formula was used.

$$GHG \left( metric\ tons\ CO_2(e) \right)$$
$$= \frac{annual\ VMT\ per\ vehicle}{MPG}$$
$$\times \#\ vehicles\ to\ be\ replaced$$
$$\times unleaded\ fuel\ emissions\ factor \left( \frac{8.81\ kgCO_2(e)}{gallon} \right)$$
$$\times conversion \left( \frac{metric\ tons}{1000\ kg} \right)$$

The same formula was used to calculate fleet replacement for Roads and Air although different assumptions were made for MPG and two types of vehicles were being replaced – passenger cars and light duty pickup trucks. Based upon the standard Roads and Airports passenger vehicle, the Dodge Stratus, versus the Prius, an estimated MPG increase for city driving was 30 and highway driving was 19. For the light duty vehicles, in comparing the common GMC pickup with hybrid pickups, a 5 MPG increase was estimated for both city and highway driving.

Making an estimate for employee commute and reimbursed miles was done almost identically to fleet emissions. ICLEI had data regarding model year for employee cars and used this to estimate $CH_4$ and $N_2O$ emissions. The Initial Commute Survey did not have this information so an average emissions factor for passenger vehicles from 1994 to 2006 was used. This factor was 0.04255 $gCH_4$/mile and 0.0363 $gN_2O$/mile.

The reductions due to the installation of fleet telematics were caculated in the *Grant Application for Transportation Fund for Clean Air Regional Funds FY 2008/09 v1.0*. The specific device to be installed was the Networkfleet 3500 System designed by Networkcar. The assumptions made were that it would be installed in 1,237 light and medium duty vehicles, each vehicle would be enrolled in the Continuous Monitoring Program, the average fleet VMT was 250 miles/week/vehicle, the average fleet MPG was 15, there would be a 5% reduction in VMT due to Networkcar, there would be an average of 10 fewer minutes idling/day/vehicle with Networkcar and there would be a fleetwide decrease of 1 mile per hour speed using Networkcar. Emission reductions figures were given in pounds of $CO_2(e)$ and subsequently converted to metric tons $CO_2(e)$.

## Waste Emissions

ICLEI calculated waste emissions using the methane commitment method outlined in the EPA WARM model in conjunction with default waste characterization data provided by the *CIWMB 1999 Waste Characterization Study*. The Waste Charazcterization Study estimates the average percentage waste breakdown as follows.

| Paper Products | Food Waste | Plant Debris | Wood/Textile | Other |
|----------------|------------|--------------|--------------|-------|
| 39.4% | 9.8% | 17.0% | 6.7% | 27.1% |

To estimate emissions, each waste section was calculated independently and then they were all totaled together. The following is an example of how the WARM model estimates emissions from one type of waste.

$$GHG \left(metric\ tons\ CO_2(e)\right)$$
$$= waste\ landfilled\ (tons)$$
$$\times conversion \left(\frac{metric\ tons}{1.102\ tons}\right)$$
$$\times \%\ of\ waste\ type\ in\ landfill$$
$$\times (1 - methane\ recovery\ factor)$$
$$\times methane\ factor \left(\frac{metric\ tons\ CO_2(e)}{metric\ tons}\right)$$

Trend data was estimated by extrapolation from the waste GHG number ICLEI reported. A ratio was found between waste tons landfilled and GHG emissions, assumed constant, and used in conjunction with 2008 waste tons landfilled to estimate GHG emissions due to 2008 waste.

## Other Emissions

Since this report does not fully investigate emissions from public lighting, closed landfills, water/sewage transport or septic systems, the calculations to estimate GHG emissions for these items are not included in this appendix. For more information regarding these emissions and a further explination of some of the equations in this appedix, refer to the LGOP report at http://www.arb.ca.gov/cc/protocols/localgov/pubs/final_lgo_protocol_2008-09-25.pdf.

## Appendix C: LEED EBOM FAQ

(follows this page)

## LEED for Existing Buildings: Operations & Maintenance

**What is LEED for Existing Buildings: Operations & Maintenance?**
LEED for Existing Buildings: Operations & Maintenance is the tool for the ongoing operations and maintenance of existing commercial and institutional buildings. The certification system identifies and rewards current best practices and provides an outline for building's to use less energy, water and natural resources; improve the indoor environment; and uncover operating inefficiencies.

**What are the benefits of LEED for Existing Buildings: Operations & Maintenance?**
LEED helps building owners and managers solve building problems, improve building performance, and maintain and improve this performance over time. LEED reduces cost streams associated with building operations, reduces environmental impacts, creates healthier and more productive employee workspaces, and provides public recognition for leadership in sustainability.  The majority of requirements for LEED for Existing Building certification are operations and maintenance best practices.  LEED for Existing Buildings: Operations & Maintenance encourages owners and operators of existing buildings to implement sustainable practices and reduce the environmental impacts of their building over their functional life cycles.

**How is LEED for Existing Buildings: Operations & Maintenance different than other LEED certification systems?**
The LEED for New Construction and Commercial Interiors Rating Systems focus largely on the construction and/or major renovation phase of a building. When the project is complete and the building is in operation, LEED for New Construction and Commercial Interiors have performed their intended task. The intent of LEED for Existing Buildings: Operations & Maintenance is to certify the operations and maintenance of the building and create a plan for ensuring high performance over time.  The rating system captures both a building's physical systems (equipment, design, land use, etc.) and the way the building is occupied and operated by its managers (waste management, temperature monitoring, commuting programs, etc.).

A key goal of LEED for Existing Buildings: Operations & Maintenance is to institutionalize a process of reporting, inspection and review over the lifespan of the building.  So when LEED is applied to new construction and commercial interiors, the one time act of renovating, constructing or tenant fit-out is certified.  LEED for Existing Buildings: Operations & Maintenance certifies the completed and operated building as it functions on an ongoing basis.

**Who should use LEED for Existing Buildings: Operations & Maintenance?**
LEED for Existing Buildings: Operations & Maintenance helps building owners and managers solve building problems, and improve building life cycle performance.  The rating system is targeted at single buildings, whether owner occupied, multi-tenanted, or multiple-building campus projects and requires three months of operational data for an initial certification; any building construction must be complete for at least a three month span before LEED certification can be pursued. Historic properties can also become certified under the rating system, and the USGBC has been working collaboratively with the National Trust for Historic Preservation to outline specific metrics that highlight and promote preservation activities as green building strategies.

Existing buildings undergoing substantial renovations are eligible to become certified under LEED for Commercial Interiors, Existing Buildings: Operations & Maintenance (upon completion of the renovation and three months of occupancy/operation) or New Construction. Comparing the requirements of LEED for Existing Buildings: Operations & Maintenance to other LEED rating systems will help you determine which rating system is better suited to your project type.

Projects that have already been certified using LEED for New Construction, LEED for Schools or LEED for Core & Shell will receive free registration if they choose to certify using LEED for Existing Buildings: Operations & Maintenance.

**How do I know if LEED for Existing Buildings: Operations & Maintenance is right for my project?**
USGBC encourages the project team to tally a potential point total using the rating system checklists for all possibilities. The project is a viable candidate for LEED certification if it can meet all prerequisites and achieve the minimum points required in a given rating system. If more than one rating system applies, then it is up to the project team to decide which one to pursue. If questions or concerns remain, please e-mail leedinfo@usgbc.org.

**How often does a project need to recertify under LEED?**
Buildings can apply for recertification as frequently as each year but must file for recertification at least once every five years to maintain their LEED for Existing Buildings: Operations & Maintenance status.  If projects do not recertify at the five year mark, their next application will be considered an initial certification application. The project must recertify all prerequisites but may drop previously earned credits or add new credits as desired.

**Is there a minimum age for a building to participate in LEED for Existing Buildings: Operations & Maintenance?**
LEED for Existing Buildings: Operations & Maintenance requires buildings to be in operations for at least 12 continuous months before certifying.

**What is the point breakdown for LEED for Existing Buildings: Operations & Maintenance?**
LEED for Existing Buildings: Operations & Maintenance ratings are awarded according to the following scale:

There are 100 base points; 6 possible Innovation in Design and 4 Regional Priority points

Certified 40–49 points
Silver 50–59 points
Gold 60–79 points
Platinum 80 points and above

**Where can I get an updated copy of the LEED for Existing Buildings: Operations & Maintenance Rating System?**
The LEED for Existing Buildings: Operations & Maintenance rating system is located within the Green Building Operations & Maintenance reference guide and is available for purchase from the USGBC Web site.

**Helpful tips to get started:**
1. Review the LEED rating system to assess credit potential
2. Set your target certification level: Certified, Silver, Gold, Platinum
3. Assess what equipment will need upgrades
4. Assign responsibility for credits and for writing green policies
5. Make a budget
6. Create a timeline to optimize work and process flow
7. Register project to take advantage of USGBC resources

**What is the process for LEED certification?**
Certification is now administered by the Green Building Certification Institute (GBCI) through a network of professional, third-party certification bodies.  To register a project for LEED certification, visit www.gbci.org.

**What educational programs are available to learn more about LEED?**
USGBC offers a variety of LEED instructor-led workshops, online courses and Webinars (live and on-demand). To learn more about USGBC's LEED curriculum, visit www.usgbc.org/education.

**Where can I get answers to additional LEED questions?** Send emails to: leedinfo@usgbc.org.